



THE IMPERIAL ENCYCLOPEDIA AND DICTIONARY

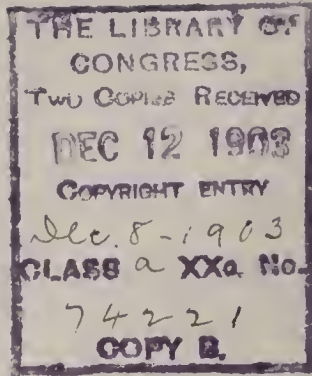
A LIBRARY OF UNIVERSAL
KNOWLEDGE AND AN UN-
ABRIDGED DICTIONARY OF
THE ENGLISH LANGUAGE
UNDER ONE ALPHABET

IN FORTY VOLUMES

VOLUME 35
SMUGGLING—STRICTURE

NEW YORK HENRY G. ALLEN & COMPANY

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SCHEME OF SOUND SYMBOLS

FOR THE PRONUNCIATION OF WORDS.

Note.—(·) is the mark dividing words respelt phonetically into syllables; ('), the accent indicating on which syllable or syllables the accent or stress of the voice is to be placed.

| Sound-symbols employed in Respelling. | Representing the Sounds as exemplified in the Words. | Words respelt with Sound-symbols and Marks for Pronunciation. |
|---------------------------------------|--|---|
| ā | mate, fate, fail, aye | ·māt, fāt, fāl, ā. |
| ă | mat, fat | ·măt, făt. |
| â | far, calm, father | ·fâr, kâm, fâ'thēr. |
| ă | care, fair | ·câr, fâr. |
| aw | fall, laud, law | ·fawl, lawd, law. |
| ē | mete, meat, feet, free | ·mēt, mēt, fēt, frē. |
| ě | met, bed | ·mět, bēd. |
| ê | her, stir, heard, cur | ·hēr, stēr, hērd, kēr. |
| î | pine, ply, height | ·pîn, plî, hît. |
| ï | pin, nymph, ability | ·pîn, nîmf, â-bîl'î-tî. |
| ō | note, toll, soul | ·nôt, tōl, sōl. |
| ö | not, plot | ·nôt, plôt. |
| ô | move, smooth | ·môv, smôth. |
| ö | Goethe (similar to <i>e</i> in her) | ·gö'tēh. |
| ow | noun, bough, cow | ·nown, bow, kow. |
| oy | boy, boil | ·boy, boyl. |
| û | pure, dew, few | ·pûr, dû, fû. |
| ÿ | bud, come, tough | ·bÿd, kÿm, tÿf. |
| û | full, push, good | ·fûl, pûsh, gûd. |
| ü | French plume, Scotch guid | ·plûm, gûd. |
| ch | chair, match | ·châr, mäch. |
| ch | German buch, Heidelberg, Scotch loch (guttural) | ·bôch, hî'del-bērçh, lôch. |
| g | game, go, gun | ·gām, gō, gûn. |
| j | judge, gem, gin | ·jÿj, jēm, jîn. |
| k | king, cat, cot, cut | ·kîng, kăt, kôt, kÿt. |
| s | sit, scene, cell, city, cypress | ·sît, sēn, sēl, sît'î, sî'prēs. |
| sh | shun, ambition | ·shÿn, âm-bîsh'ÿn. |
| th | thing, breath | ·thîng, brēth. |
| th | though, breathe | ·thō, brēth. |
| z | zeal, maze, muse | ·zēl, māz, mûz. |
| zh | azure, vision | ·ăzh'ēr, vîeh'ÿn. |

ABBREVIATIONS USED IN THIS WORK.

a., or adj.....adjective
A.B......Bachelor of Arts
abbr......abbreviation, abbreviated
abl. or abla.ablative
Abp......Archbishop
abt......about
Acad......Academy
acc. or ac.accusative
accom.....accommodated, accommodation
act......active
A.D......in the year of our Lord [*Anno Domini*]
Adj......Adjutant
Adm......Admiral
adv. or ad.adverb
A. F......Anglo-French
Ag......Silver [*Argentum*]
agri......agriculture
A. L......Anglo-Latin
Al......Aluminium
Ala......Alabama
Alb......Albanian
alg......algebra
A.M......before noon [*ante meridiem*]
A.M......Master of Arts
Am......Amos
Amer......America, -n
anat......anatomy, anatomical
anc......ancient, anciently
AN. M.....in the year of the world [*Anno Mundi*]
anon......anonymous
antiq......antiquity, antiquities
aor......aorist, -ic
app......appendix
appar......apparently
Apr......April
Ar......Arabic
arch......architecture
archæol....archæology
arith......arithmetic
Ark......Arkansas
art......article
artil......artillery
A.S......Anglo-Saxon
AsArsenic
Assoc.....Association
asst......assistant
astrol.....astrology
astron....astronomy
attrib.....attributive
atty......attorney
at. wt.....atomic weight
Au......Gold [*Aurum*]

A.U.C......in the year of the building of the city (Rome) [*Anno urbis conditæ*]
Aug......August
aug......augmentative
Aust......Austrian
A. V......authorized version [of Bible, 1611]
avoir.....avoids
B......Boron
B......Britannic
b......born
Ba......Barium
Bart.....Baronet
Bav......Bavarian
bl.; bbl....barrel; barrels
B.C......before Christ
B.C.L.....Bachelor of Civil Law
B.D......Bachelor of Divinity
bef......before
Belg.....Belgic
Beng.....Bengali
Bi......Bismuth
biog.....biography, biographical
biol.....biology
B.L......Bachelor of Laws
Bohem....Bohemian
bot......botany, botanical
Bp......Bishop
Br......Bromine
Braz.....Brazilian
Bret.....Breton
Brig.....Brigadier
Brit.....British, Britannica
bro......brother
Bulg.....Bulgarian
bush.....bushel, bushels
C......Carbon
c......century
Ca......Calcium
Cal.....California
Camb.....Cambridge
Can.....Canada
Cant.....Canterbury
cap.....capital
Capt.....Captain
Card.....Cardinal
carp.....carpentry
Cath.....Catholic
caus.....causative
cav.....cavalry
Cd......Cadmium
Ce......Cerium
Celt.....Celtic
cent.....central
cf......compare [*confer*]
ch or chh....church

ABBREVIATIONS.

Chal.....Chaldee
 chap.....chapter
 chem.....chemistry, chemical
 Chin.....Chinese
 Chron.....Chronicles
 chron.....chronology
 Cl.....Chlorine
 Class.....Classical [= Greek
 and Latin]
 Co.....Cobalt
 Co.....Company
 co.....county
 cog.....cognate [with]
 Col.....Colonel
 Col.....Colossians
 Coll.....College
 colloq.....colloquial
 Colo.....Colorado
 Com.....Commodore
 com.....commerce, commer-
 cial
 com.....common
 comp.....compare
 comp.....composition, com-
 pound
 compar.....comparative
 conch.....conchology
 cong.....congress
 Congl.....Congregational
 conj.....conjunction
 Conn or Ct.....Connecticut
 contr.....contraction, con-
 tracted
 Cop.....Coptic
 Cor.....Corinthians
 Corn.....Cornish
 corr.....corresponding
 Cr.....Chromium
 crystal.....crystallography
 Cs.....Cæsium
 ct.....cent
 Ct.or Conn.....Connecticut
 Cu.....Copper [*Cuprum*]
 cwt.....a hundred weight
 Cyc.....Cyclopedia
 D.....Didymium
 D. or Dut.....Dutch
 d.....died
 d. [l. s. d.].....penny, pence
 Dan.....Daniel
 Dan.....Danish
 dat.....dative
 dau.....daughter
 D. C.....District of Columbia
 D.C.L.....Doctor of Civil [or
 Common] Law
 D.D.....Doctor of Divinity
 Dec.....December
 dec.....declension
 def.....definite, definition
 deg.....degree, degrees
 Del.....Delaware
 del.....delegate, delegates
 dem.....democratic
 dep.....deputy
 dep.....deponent
 dept.....department
 deriv.....derivation, deriva-
 tive
 Deut.....Deuteronomy
 dial.....dialect, dialectal
 diam.....diameter
 Dic.....Dictionary

diff.....different, difference
 dim.....diminutive
 dist.....district
 distrib.....distributive
 div.....division
 doz.....dozen
 Dr.....Doctor
 dr.....dram, drams
 dram.....dramatic
 Dut. or D.....Dutch
 dwt.....pennyweight
 dynam or
 dyn.....dynamics
 E.....Erbium
 E. or e.....East, -ern, -ward
 E. or Eng.....English
 Eccl.....Ecclesiastes
 eccl. or } ecclesiastical [af-
 eccles.... } fairs]
 ed.....edited, edition, edi-
 tor
 e.g.....for . example [*ex*
gratia]
 E. Ind. or } East Indies, East
 E. I. } Indian
 elect.....electricity
 Emp.....Emperor
 Encyc.....Encyclopedia
 Eng. or E.....English
 engin.....engineering
 entom.....entomology
 env. ext.....envoy extraordinary
 ep.....epistle
 Eph.....Ephesians
 Episc.....Episcopal
 eq. or =.....equal, equals
 equiv.....equivalent
 esp.....especially
 Est.....Esther
 estab.....established
 Esthon.....Esthonian
 etc.....and others like [*et*
cetera]
 Eth.....Ethiopic
 ethnog.....ethnography
 ethnol.....ethnology
 et seq.....and the following
 [*et sequentia*]
 etym.....etymology
 Eur.....European
 Ex.....Exodus
 exclam.....exclamation
 Ezek.....Ezekiel
 Ezr.....Ezra
 F.....Fluorine
 F. or Fahr.....Fahrenheit
 f. or fem.....feminine
 F. or Fr.....French
 fa.....father
 Fahr. or F.....Fahrenheit
 far.....farriery
 Fe.....Iron [*Ferrum*]
 Feb.....February
 fem or f.....feminine
 fig.....figure, figuratively
 Fin.....Finnish
 F.—L.....French from Latin
 Fla.....Florida
 Flem.....Flemish
 for.....foreign
 fort.....fortification
 Fr. or F.....French
 fr.....from

ABBREVIATIONS.

freq.....frequentative
Fris.....Frisian
ft.....foot, feet
fut.....future
G. or Ger...German
G.....Glucinium
Ga.....Gallium
Ga.....Georgia
Gael.....Gaelic
Gal.....Galatians
gal.....gallon
galv.....galvanism, galvanic
gard.....gardening
gen.....gender
Gen.....General
Gen.....Genesis
gen.....genitive
Geno.....Genoese
geog.....geography
geol.....geology
geom.....geometry
Ger.....German, Germany
Goth.....Gothic
Gov.....Governor
govt.....government
Gr.....Grand, Great
Gr.....Greek
gr.....grain, grains
gram.....grammar
Gr. Brit...Great Britain
Gris.....Grisons
gun.....gunnery
H.....Hegira
H.....Hydrogen
h.....hour, hours
Hab.....Habakkuk
Hag.....Haggai
H. B. M....His [or Her] Britan-
 nic Majesty
Heb.....Hebrew, Hebrews
her.....heraldry
herpet.....herpetology
Hg.....Mercury [*Hydrar-*
 gyrum]
hhd.....hogs-head, hogsheds
Hind.....Hindustani, Hindu,
 or Hindi
hist.....history, historical
Hon.....Honorable
hort.....horticulture
Hos.....Hosea
Hung.....Hungarian
Hydros...Hydrostatics
I.....Iodine
I.; Is......Island; Islands
Icel.....Icelandic
ichth.....ichthyology
Ida.....Idaho
i.e......that is [*id est*]
Ill.....Illinois
illus.....illustration
impera or
 impr.....imperative
impers.....impersonal
imp for imp imperfect
impf. p. or
 imp.....imperfect participle
improp.....improperly
In.....Indium
in.....inch, inches
incept.....inceptive
Ind.....India, Indian
Ind.....Indiana

ind.....indicative
indef.....indefinite
Indo-Eur...Indo-European
inf.....infantry
inf or infin infinitive
instr.....instrument, -al
int.....interest
intens.....intensive
interj. or
 int.....interjection
interrog...interrogative pro-
 noun
intr. or
 intrans...intransitive
Io.....Iowa
Ir.....Iridium
Ir.....Irish
Iran.....Iranian
irr.....irregular, -ly
Is.....Isaiah
It.....Italian
Jan.....January
Jap.....Japanese
Jas.....James
Jer.....Jeremiah
Jn.....John
Josh.....Joshua
Jr.....Junior
Judg.....Judges
K.....Potassium [*Kalium*]
K.....Kings [in Bible]
K.....king
Kan.....Kansas
Kt.....Knight
Ky.....Kentucky
L.....Latin
L.....Lithium
l. [l. s. d.], { pound, pounds
 or £..... } [sterling]
La.....Lanthanum
La.....Louisiana
Lam.....Lamentations
Lang.....Languedoc
lang.....language
Lap.....Lapland
lat.....latitude
lb.; llb. or { pound; pounds
 lbs..... } [weight]
Let.....Lettish
Lev.....Leviticus
LG.....Low German
L.H.D......Doctor of Polite Lit-
 erature
Lieut.....Lieutenant
Lim.....Limousin
Lin.....Linnæus, Linnæan
lit.....literal, -ly
lit.....literature
Lith.....Lithuanian
lithog.....lithograph, -y
LL.....Late Latin, Low
 Latin
LL.D......Doctor of Laws
long.....longitude
Luth.....Lutheran
M.....Middle
M......Monsieur
m......mile, miles
m. or masc. masculine
M.A......Master of Arts
Macc.....Maccabees
mach.....machinery
Mag.....Magazine

ABBREVIATIONS.

| | |
|---------------------------------|---------------------------------|
| Maj. Major | N. A., or |
| Mal..... Malachi | N. Amer. North America, -n |
| Mal..... Malay, Malayan | nat..... natural |
| manuf..... manufacturing, | naut..... nautical |
| manufacturers | nav..... navigation, naval af- |
| Mar..... March | fairs |
| masc or m. masculine | Nb..... Niobium |
| Mass..... Massachusetts | N. C. or |
| math. mathematics, math- | N. Car... North Carolina |
| ematical | N. D..... North Dakota |
| Matt..... Matthew | Neb..... Nebraska |
| M.D..... Doctor of Medicine | neg..... negative |
| MD..... Middle Dutch | Neh..... Nehemiah |
| Md..... Maryland | N. Eng..... New England |
| ME..... Middle English, or | neut or n... neuter |
| Old English | Nev..... Nevada |
| Me..... Maine | N.Gr..... New Greek, Modern |
| mech..... mechanics, mechani- | Greek |
| cal | N. H. New Hampshire |
| med..... medicine, medical | NHG..... New High German |
| mem..... member | [German] |
| mensur.... mensuration | Ni.... Nickel |
| Messrs. or | N. J..... New Jersey |
| MM..... Gentlemen, Sirs | NL..... New Latin, Modern |
| metal..... metallurgy | Latin |
| metaph.... metaphysics, meta- | N. Mex..... New Mexico |
| physical | N. T., or |
| meteor.... meteorology | N. Test... New Testament |
| Meth..... Methodist | N. Y..... New York [State] |
| Mex..... Mexican | nom..... nominative |
| Mg..... Magnesium | Norm. F... Norman French |
| M.Gr..... Middle Greek | North. E... Northern English |
| MHG..... Middle High Ger- | Norw... Norwegian, Norse. |
| man | Nov..... November |
| Mic..... Micah | Num..... Numbers |
| Mich.... Michigan | numis.... numismatics |
| mid..... middle [voice] | O..... Ohio |
| Milan..... Milanese | O..... Old |
| mid. L. or } Middle Latin, Me- | O..... Oxygen |
| ML..... } diæval Latin | Obad..... Obadiah |
| milit. or | obj..... objective |
| mil.... military [affairs] | obs. or †... obsolete |
| min..... minute, minutes | obsoles.... obsolescent |
| mineral.... mineralogy | O.Bulg.... Old Bulgarian or Old |
| Minn..... Minnesota | Slavic |
| Min. Plen. Minister Plenipoten- | Oct..... October |
| tiary | Odontog... odontography |
| Miss..... Mississippi | OE..... Old English |
| ML. or } Middle Latin, Me- | OF or |
| mid. L... } diæval Latin | O. Fr... Old French |
| MLG..... Middle Low German. | OHG..... Old High German |
| Mlle..... Mademoiselle | Ont..... Ontario |
| Mme..... Madam | opt.... optics, optical |
| Mn..... Manganese | Or..... Oregon |
| Mo..... Missouri | ord..... order |
| Mo..... Molybdenum | ord..... ordnance |
| mod..... modern | org..... organic |
| Mont..... Montana | orig..... original, -ly |
| Mr..... Master [Mister] | ornith.... ornithology |
| Mrs..... Mistress [Missis] | Os..... Osmium |
| MS.; MSS. manuscript; manu- | OS.... Old Saxon |
| scripts | O. T., or |
| Mt..... Mount, mountain | O. Test... Old Testament |
| mus..... music | Oxf..... Oxford |
| MUS.DOC... Doctor of Music | oz..... ounce, ounces |
| myth..... mythology, mytho- | P..... Phosphorus |
| logical | p.; pp.... page; pages |
| N..... Nitrogen | p., or part. participle |
| N. or n.... North, -ern, -ward | Pa. or Penn. Pennsylvania |
| n..... noun | paint..... painting |
| n or neut... neuter | palæon.... palæontology |
| Na..... Sodium [Natrium] | parl..... parliament |
| Nah..... Nahum | pass..... passive |

ABBREVIATIONS.

pathol or
 path.....pathology
 Pb.....Lead [*Plumbum*]
 Pd.....Palladium
 Penn or Pa. Pennsylvania
 perf.....perfect
 perh.....perhaps
 Pers.....Persian, Persic
 pers.....person
 persp.....perspective
 pert.....pertaining [to]
 Pet.....Peter
 Pg. or Port. Portuguese
 phar.....pharmacy
 PH.D.....Doctor of Philoso-
 phy
 Phen.....Phenician
 Phil.....Philippians
 Philem.....Philemon
 philol.....philology, philologi-
 cal
 philos. { philosophy, philo-
 or phil... } sophical
 phonog.....phonography
 photog.....photography
 phren.....phrenology
 phys.....physics, physical
 physiol... physiology, physi-
 ological
 Pied.....Piedmontese
 Pl.....Plate
 pl. or plu...plural
 Pl. D.....Platt Deutsch
 plupf.....pluperfect
 P.M.....afternoon[*post meri-*
 diem]
 pneum.....pneumatic
 P. O.....Post-office
 poet.....poetical
 Pol.....Polish
 pol econ...political economy
 polit.....politics, political
 pop... ..population
 Port. or Pg. Portuguese
 poss.....possessive
 pp.....pages
 pp.....past participle, per-
 fect participle
 p. pr.present participle
 Pr. or Prov. Provençal
 pref.....prefix
 prep.....preposition
 Pres.....President
 pres.....present
 Presb.....Presbyterian
 pret.....preterit
 prim.....primitive
 priv.....privative
 prob.....probably, probable
 Prof.....Professor
 pron.....pronoun
 pron.....pronunciation, pro-
 nounced
 prop.....properly
 pros.....prosody
 Prot.....Protestant
 Prov. or Pr. Provençal
 Prov.....Proverbs
 prov.....province, provincial
 Prov. Eng.. Provincial English
 Prus.....Prussia, -n
 Ps.....Psalm, Psalms
 psychol....psychology

pt.....past tense
 pt.....pint
 Pt.....Platinum
 pub.....published, publisher,
 publication
 pwt.....pennyweight
 Q.....Quebec
 qt.....quart
 qtr.....quarter [weight]
 qu.....query
 q.v.....which see [*quod*
 vide]
 R.....Rhodium
 R.....River
 Rb.....Rubidium
 R. Cath....Roman Catholic
 rec. sec....recording secretary
 Ref.....Reformed
 refl.....reflex
 reg.....regular, -ly
 regt.....regiment
 rel. pro. or
 rel.....relative pronoun
 repr.....representing
 repub.....republican
 Rev... ..Revelation
 Rev.....The Reverend
 Rev. V....Revised Version
 rhet.....rhetoric, -al
 R. I.....Rhode Island
 R. N.....Royal Navy
 Rom.....Roman, Romans
 Rom.....Romanic or Ro-
 mance
 Rom. Cath. { Roman Catholic
 Ch. or R. }
 C. Ch.... } Church
 r.r.....railroad
 Rt. Rev...Right Reverend
 Ru.....Ruthenium
 Russ.....Russian
 r.w.....railway
 S.....Saxon
 S.....Sulphur
 s.....second, seconds
 s. [l. s. d.]..shilling, shillings
 S. or s.....South, -ern, -ward
 S. A. or
 S. Amer..South America, -n
 Sam.....Samaritan
 Sam.....Samuel
 Sans, or
 Skr.....Sanskrit
 Sb.....Antimony [*Stibium*]
 s.c.....understand, supply
 namely [*scilicet*]
 S. C. or
 S. Car....South Carolina
 Scand.....Scandinavian
 Scot.....Scotland, Scotch
 scr.....scruple, scruples
 Scrip.....Scripture [s], Scrip-
 tural
 sculp.....sculpture
 S. D.....South Dakota
 Se.....Selenium
 sec.... ..secretary
 sec.....section
 Sem.....Semitic
 Sep.....September
 Serv.....Servian
 Shaks.....Shakespeare
 Si.....Silicon

ABBREVIATIONS.

| | | | |
|---------------|-----------------------------------|--------------|---|
| Sic..... | Sicilian | trigen..... | trigonometry |
| sing..... | singular | Turk..... | Turkish |
| sis..... | sister | typog..... | typography, typo |
| Skr. or | | | graphical |
| Sans.... | Sanskrit | U..... | Uranium |
| Slav..... | Slavonic, Slavic | ult. | ultimate, -ly |
| Su | Tin [<i>Stannum</i>] | Unit..... | Unitarian |
| Soc..... | Society | Univ..... | Universalist |
| Song Sol... | Song of Solomon | Univ... .. | University |
| Sp | Spanish | U. Presb... | United Presbyterian |
| sp. gr.... | specific gravity | U. S.... .. | United States |
| sq..... | square | U. S. A.... | United States Army |
| Sr..... | Senior | U. S. N.... | United States Navy |
| Sr | Strontium | Ut..... | Utah |
| | Saint | V..... | Vanadium |
| | street | v..... | verb |
| stat..... | statute | Va..... | Virginia |
| s.T.D..... | Doctor of Sacred Theology | var..... | variant [word] |
| subj..... | subjunctive | var..... | variety of [species] |
| suf..... | suffix | Ven..... | Venerable |
| Su. Goth... | Suo-Gothic | Venet..... | Venetian |
| superl ... | superlative | vet.... .. | veterinary |
| Supp..... | Supplement | v. i. or | |
| Supt | Superintendent | v. intr.... | verb intransitive |
| surg..... | surgery, surgical | vil..... | village |
| Surv..... | surveying | viz..... | namely, to-wit [<i>vide-</i> <i>licet</i>] |
| Sw..... | Swedish | v. n..... | verb neuter |
| Swab..... | Swabian | voc | vocative |
| sym..... | symbol | vol..... | volume |
| syn..... | synonym, -y | vols..... | volunteers |
| Syr..... | Syriac, Syrian | Vt..... | Vermont |
| t | town | v. tr..... | verb transitive |
| Ta... .. | Tantalum | W..... | Tungsten [<i>Wolfram</i>] |
| Tart..... | Tartar | W | Welsh |
| Te..... | Tellurium | W. or w.... | West, -ern, -ward |
| technol ... | technology | Wal | Walachian |
| teleg..... | telegraphy | Wall | Walloon |
| Tenn..... | Tenne-see | Wash..... | Washington |
| term..... | termination | Westph.... | Westphalia, -n |
| terr | territory | W. Ind. } | West Indies, West |
| Teut..... | Teutonic | or W. I... } | Indian |
| Tex..... | Texas | Wis..... | Wisconsin |
| Th | Thorium | wt..... | weight |
| theat | theatrical | W. Va..... | West Virginia |
| theol | theology, theological | Wyo..... | Wyoming |
| therap..... | therapeutics | Y..... | Yttrium |
| Thess | Thessalonians | yd..... | yard |
| Ti..... | Titanium | yr..... | year |
| Tim..... | Timothy | Zech..... | Zechariah |
| Tit..... | Titus | Zeph. | Zephaniah |
| Tl | Thallium | Zn | Zinc |
| toxicol | toxicology | zool..... | zoology, zoological |
| tp..... | township | Zr..... | Zirconium |
| tr. or trans. | transitive | | |
| transl..... | translation, trans. lated | | |

See also ABBREVIATIONS: in Vol. I.

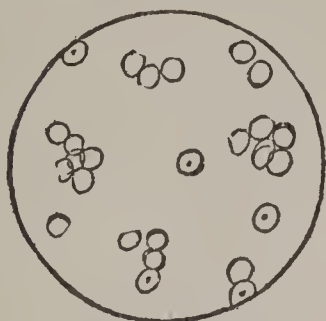
IMPERIAL ENCYCLOPEDIA AND DICTIONARY.

SMUG'GLING: importing, or (in countries that levy export duties) exporting, goods prohibited, or without paying the duties imposed on goods not prohibited. The offense in general leads to forfeiture of the goods. In the United States, if goods are imported to defraud the revenue, the goods are forfeited, and the guilty party is liable to a fine of \$50 to \$5,000, or imprisonment not exceeding 2 years, or both. Penalties are prescribed also for officers of vessels who connive at S., or who resist the revenue officers. The revenue officers have power to search the persons as well as the baggage of travellers entering the United States from foreign countries. The dist. atty. prosecutes in the U. S. dist. or circuit court, persons alleged guilty of violating the revenue laws by S. After condemnation and sale of the smuggled goods, the proceeds, less costs and expenses, are distributed, part going to the informer (if he is not in the revenue service), part to the custom-house officers of the port, and part to the public treasury. The court may, on probable cause alleged, grant to a customs officer an order requiring an importing merchant, or other importer of dutiable goods, to exhibit his books or bills of lading.—See U. S. Revised Statutes, xxxiv. 10.

SMUT, n. *smūt* [Low Ger. *smudden*, to dirty: Dan. *smuds*; Sw. *smuts*; Ger. *schmutz*, dirt, mud: Dut. *smotsen*, to stain; *smoddig*, smutty]: a spot or stain made with soot or other dirty substance; the dirty or foul matter itself; obscenity: fungoid disease in grain by which the grain is converted into a soot-like powder (see below): V. to foul; to stain; to tarnish or blacken; to be attacked with the disease of smut, as grain. **SMUT'TING**, imp. **SMUT'TED**, pp. **SMUT'TY**, a. *-tī*, soiled with soot or the like; full of smut; dirty; obscene. **SMUT'TILY**, ad. *-tī-lī*. **SMUT'TINESS**, n. *-nēs*, the quality or condition of being smutty. **SMUTCH**, n. *smūch*, a foul stain; a dirty mark: V. to blacken; to mark with soot or coal. **SMUTCH'ING**, imp. **SMUTCHED**, pp. *smūcht*,

SMUT—SMYRNA.

SMUT: popular name of certain small fungi of section *Coniomycetes*, and group or family *Uredineæ*, parasitical on



Spores of Smut.

plants, particularly on grasses, and notable for the abundance of dark-colored spores which they throw off. The name S., though somewhat variously used, is now generally limited to the genus *Ustilago*, in which the character above mentioned of the profusion of dark-colored spores is very remarkable. A remarkable kind of S. infests maize, swelling the ears to enormous size, sometimes even 12 inches in length. On cereals, the fungi usually attack the floral portion, but appear sometimes on other parts of the plant. They change the nutritive matter of the grain or plant into a black, and in some cases poisonous substance. As the disease does not spread from one plant to another, but is propagated by spores which become active when the seed germinates, and which develop within the substance of the plant, it cannot, after it has once appeared, be eradicated without sacrificing the plant itself. Preventive measures are the selection of the heaviest and best grain for seed; washing the seed in a strong solution of blue vitriol, using one pound of vitriol for each gallon of water, or in water heated to a temperature of 135°; the use of salt as a fertilizer; careful covering of the seed; and, as far as possible, the selection of fields which are free from taint of the disease. Treatment of the seed often fails to prevent S., because it has no effect on spores already in the soil. The *Ustilago segetum*, or dust-brand, attacks wheat and oats, and converts the heads into masses of black dust (see ERGOT). *Tilletia tritica*, affecting wheat and often very destructive, changes the interior of the kernel into a black powder with extremely offensive odor, but gives no external sign of its presence. This form of S. is known in England as the Wheat-bunt. *Ustilago maydis* is the S. of Indian corn (see INDIAN CORN); *Urocystis occulta* attacks rye, and *Urocystis cepulæ* sometimes injures the onion.

The reeds of the fenny districts of England are often much affected by a species (*Ustilago typhoides*), which much impairs their quality for all purposes, and has the more remarkable property of greatly affecting the health of the laborers employed in cutting and sorting them, producing not only a sense of oppression, but swelling of the head, formation of vesicles, and inflammation of the bowels, besides other symptoms, such as are often produced by cantharides.

SMYRNA, *smér'na*: one of the most ancient and important cities of Asia Minor, and the only one of the Greek cities on the w. coast which has retained its name and importance to the present day. The early history of S. is very obscure; varying accounts represent it either as originally an Ionian colony, or as having been at first an Æolian city, which, by treachery, fell into the hands of

Colophonian (Ionian) exiles, and subsequently, about B.C. 700, formed part of the great Ionian League. This earliest city of S., known among the Greeks as 'Old Smyrna,' was on the banks of the little river Meles, on the n.e. side of the Hermæan Gulf, now the Gulf of S. (q.v.), and, being one of the cities that claimed the honor of being the birth-place of Homer, here, near the source of the river, a grotto was shown, in which he was said to have composed his poems. This old city of S. was destroyed, we are told, by the Lydian king Alyattes, and the place remained deserted and in ruins till after the Macedonian conquest, when the city was rebuilt between two and three m.s. of its original site. This city of 'New S.' was founded by Antigonos, and enlarged and embellished by Lysimachus; it was laid out with great magnificence, and adorned with several fine buildings, among which was the *Homereum*, where the poet was worshipped as a hero. The city had an excellent harbor; and from its admirable situation, soon became one of the finest and most flourishing in the ancient world. In the early history of Christianity, S. holds a distinguished place as one of the Seven Churches addressed in the Apocalypse, and as the scene of the labors and martyrdom of its first bishop, Polycarp. After various vicissitudes during the middle ages, it fell finally into the hands of the Turks, in whose possession it has since remained—the most flourishing city of the Levant.

The modern city of S. (Turkish *Izmîr*) occupies the site of New S., being built partly on the plain at the head of the gulf, partly on the declivity of a hill, the ancient Mons Pagus; and, from the sea, has an attractive appearance. There are some good quays, and some handsome buildings of stone; but the greater part consists of low wooden houses, mostly one story high; and the streets, with few exceptions, are ill-paved, narrow, crooked, and dirty. The city, however, in these respects is better than most other Turkish towns, and improvements have of late years been made. As usual in Turkish towns, each element of the mixed pop. has its separate quarter. S. contains several Greek, Armenian, Rom. Cath., and Prot. churches, and about 20 mosques. There are six journals published in five different languages. The harbor is excellent; ships of large burden anchor close to the quays; and the trade is very important and extensive. A railway, 81 m. long, constructed mainly with English capital and by English engineers, connects S. with Aidin, an important inland commercial town. Another railway, 61 m. inland (to Cassaba), extends to Philadelphia (Alasher). The chief imports are woolen, cotton, and silk fabrics, iron, tin, lead, copper, steel, zinc, glass, and hardware goods, coffee (6,000,000 lbs. annually), sugar, spirits, spices, indigo, cochineal, etc. Exports are wool, cotton, silk, carpets, hides, opium, madder, copper, valonia, olive-oil, drugs, and gums, figs, raisins, and many other articles. More than 2,500 vessels (of about 1,500,000 tons) annually enter and clear the port. The annual value of imports averages about \$15,000,000, and of exports about \$20,000,000.

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S. is regularly visited by the ships of the French, Austrian, and Russian Steam-navigation companies, and by traders from many countries. It suffered severely from fire in the summers of 1841 and 45, and has been often ravaged by earthquakes and the plague. The city and its territory are governed by a pasha. Of the ancient cities, not much remains. Some slight ruins mark the site of Old S. Of New S., some remnants of the massive walls on the hill s.e. of the city are still seen; the site of the Stadium in which Polycarp is supposed to have suffered martyrdom, is pointed out; there are fragments of the ancient theatre; and columns belonging to a temple; and numberless architectural fragments have been built into the walls of the Turkish town, or used in construction of graves in the large Turkish cemetery. Pop.(1890) 210,000, of whom probably more than 150,000 are Turks, with half as many Greeks; Jews and Armenians in considerable number, with Franks, constitute the remainder.

SMYRNA, GULF OF: inlet of the Ægean Sea, on the w. coast of Asiatic Turkey, named from the city of Smyrna (q.v.), at its head. It is 40 m. long, about 20 m. in greatest breadth, and contains several islands. Its waters are deep, and it affords good anchorage.

SMYTH, *smith*, CHARLES PIAZZI, LL.D.: astronomer: b. Naples, 1819. He was educated in England; began his astronomical service at the Royal Observatory, Cape of Good Hope, 1835; and was first astronomer royal for Scotland at the Royal Observatory, Edinburgh, 1845-88. He assisted in remeasuring La Caille's s. African arc of the meridian; established a daily time-ball and an electrically-fired daily time-gun in Edinburgh; visited and reported on Russian observatories 1859; visited and published minute investigations and curious theories on the great pyramid in Egypt 1864-5; compiled a star-catalogue and ephemeris (pub. 1877-86); and 1890-1 was compiling the 16th vol. of the Edinburgh observatory series, on *Spectroscopy*.

SMYTH, EGBERT COFFIN, D.D.: b. Brunswick, Me., 1829, Aug. 24: theologian: son of William S., author of math. text-books. He graduated at Bowdoin Coll. 1848, and Bangor Theol. Seminary 1853; was prof. of rhet. at Bowdoin 1854-56, and of nat. and revealed religion 1856-63. In 1863 he became prof. of eccles. hist. in Andover Theol. Seminary, and, 15 years later, pres. of the faculty. His name has been prominently connected with what is known as the new theology and the Andover case. On complaint to the Board of Visitors of the seminary (whose office, originally intended as an additional safeguard to the orthodoxy of the institution, is in dispute, as only or as more than appellate), a preliminary hearing, 1886, Oct. 25, was had before this board, on 16 counts, against doctrines inculcated by five professors. The complaint, amended to be more specific and against each prof. separately, was taken up, with answers filed, Dec. 28; and the board found that Prof. S. taught beliefs inconsistent with the creed of the seminary, in regard to the infallibility of the Bible, the power to repent without knowledge of Christ,

SMYTH—SNAIL.

and a probation after death for those who have not known of and decisively rejected Christ in this life. The matter went to the Mass. supreme court, on appeal in respect to points of law—the trustees of the seminary sustaining Prof. S. The supreme court decided that the action of the visitors was void through a technical defect in their early proceedings: the practical result at this stage being that Prof. S. retained his chair. He has edited the *Andover Review* since its establishment 1884, has published sermons, and a lecture on the *Value of the Study of Church History in Ministerial Education* (1874); and was co-translator of Uhlhorn's *Conflict of Christianity with Heathenism* (1879).

SMYTH, SAMUEL PHILLIPS NEWMAN, D.D.: Congl. minister, and author: b. Brunswick, Me., 1843, June 25; bro. of Dr. Egbert C. S. He graduated at Bowdoin 1863; taught in the naval acad. at Newport, R. I.; was officer in a Me. regt. of vols. in the civil war; after which he graduated at Andover Theol. Seminary. His pastorates have been Congl. at Providence, R. I.: Congl. at Bangor 1870–75; 1st Presb. Chh., Quincy, Ill., 1876–82: and, since then, the First Chh. (Congl.), New Haven, Conn. He is regarded as one of the exponents of the 'new theology,' and has published *The Religious Feeling* (1877); *Old Faiths in New Light* (1879); *The Orthodox Theology of To-day* (1881); *The Reality of Faith* (1884); *Personal Creeds* (1890).

SNACK, n. *snäk* [Low Ger. *snapps*; Ger. *schnapps*, interjections expressing 'quickness': Sw. *snabb*, quick: Scot. *snak*, a snap of the jaws]: a share; a slight hasty meal. To GO SNACKS, to go shares; to share and share alike.

SNAFFLE, n. *snäffl* [Dut. *snavel*, a horse's muzzle: Low Ger. *snavel*; Ger. *schnabel*; O. Dut. *snabbe*, a snout or beak]: a bridle crossing the nose, and having a slender mouth-bit without branches: V. to manage with a snaffle; to bridle. SNAF'FLING, imp. *-fling*. SNAF'FLED, pp. *-fld*.

SNAG, n. *snäg* [Gael. *snaigh*, to cut, to carve: Scot. *sneg*, to cut with the sudden blow of a sharp instr.: Icel. *snagi*, a clothes-peg]: a short rough branch; a knot; a sharp protuberance; a tooth projecting beyond the rest; a sunken tree, of which one end appears at or near the surface in a river, while the other is firmly fixed at the bottom: V. to hew roughly, as with an axe; to disable or pierce by means of the trunk of a tree floating end upward in a river, as to *snag* a boat. SNAG'GING, imp. SNAGGED, pp. *snägd*: ADJ. full of snags; full of sharp protuberances. SNAGGY, a. *snäg'gĩ*, abounding with snags; full of short rough branches or sharp points; knotty.

SNAIL, n. *snāl* [AS. *snægl*; Ger. *schnecke*; Dan. *snegl*; Icel. *snigill*, a snail: Swiss, *schnaken*; AS. *snícan*, to creep]: small, slimy, slow-creeping creature, some species of which have shells: a drone; a slow-moving person. SNAIL-LIKE, a. resembling a snail; slow-moving. SNAIL-CLOVER, plant, so called from its pods resembling the shells of snails; called also *snail-trefoil*, the *Medicāgo scutellāta*, ord. *Legumīnōsæ*. SNAIL-SHELL, shell that

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covers a snail.—The *Snail* (*Helix*) is the common name for gasteropodous mollusks of family *Helicidæ*, having generally a sub-globose, sometimes a depressed, spiral shell; the mouth of the shell more or less encroached upon by the last whorl but one, strengthened with an internal thickened rib, its edges more or less reflexed; the *foot* of the animal long, and pointed behind; the tentacles four, the lower pair much smaller than the upper; the tongue armed with many—often 100 to 200—longitudinal rows of teeth. The species are very numerous, more than 1,400 having been described; besides many fossil species. Some of the groups have been constituted into separate genera by recent authors, but all retain the popular name S., which is indeed often extended to all the *Helicidæ*. As an instance of the general distribution of snails, *Helix aspersa*, one of the common garden-snails of Britain, is found generally throughout Europe, great part of Asia and n. of Africa, and in S. America.—Snails feed chiefly on vegetable substances, though they are indiscriminate in their appetite, and even devour the dead of their own kind. The mischief which they do to garden-crops is well known; and gardeners lay down cabbage-leaves and the like to attract them, in order that they may be destroyed; any greasy substance increasing the attractiveness of the bait.—Snails delight in warm moist weather; in dry weather, their chief time of activity is at night, and they hide themselves by day; but after rain, they come forth at



Common Snail and Eggs (*Helix aspersa*):

1, Eggs; 2, Appearance when newly hatched; 3, Slightly advanced stage; 4, Mature Snail.—Copied from Morton's *Cyclopædia of Agriculture*.

any hour in quest of food. At the approach of winter, or in very dry weather, they close the mouth of the shell with a membrane (*epiphragm*), formed by the drying of the mucous substance which they secrete, and become inactive and torpid. Some, as the Edible S. (*H. pomatia*), make a succession of such membranes; the outer one of which is also strengthened by a quantity of calcareous matter, the secretion being at first a white viscid fluid, but quickly hardening like plaster of Paris. When this is to be removed, a fresh secretion of fluid mucus softens it at the edges. Snails retreat into crevices for the winter, or

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into holes which they make in the earth, and which are roofed over with earth, dead leaves, etc., agglutinated by secreted mucus.—Snails are hermaphrodite, but mutual impregnation takes place, and when they are about to copulate, they excite each other by pricking or even piercing with a sharp calcareous glass-like style, affixed to a peculiar muscular sac which serves for its protrusion, and which is produced by recent secretion, not being found in them on dissection, except at the season of reproduction. Extraordinary as this fact is, it has been the subject of much exaggeration; and in works on natural history not of very old date, we read of snails throwing darts (*spicula amoris*) at each other, all which appears fabulous, though it is probable that the calcareous style may be often broken off in its use. The eggs of snails are round, and enveloped in a skin; they are deposited generally in little clusters. The eggs of the common garden-snails of Britain are about the size of peas, and deposited just under the surface of the soil.—Snails possess in very high degree the power of repairing injuries, not only of the shell—though the removal of the whole shell is fatal to them—but also of the soft parts. When the tentacles are cut off, they grow again; and even if the head is cut off, a new head is produced.—The EDIBLE S. (*H. pomatia*) of s. Europe is found in the chalk and oolite districts of s. England, where it is said to have been introduced from the continent in the 17th c.; but this is doubtful. It has a shell about two inches in diameter and two inches in height, whitish or pale tawny, with four darker bands, often not very distinct. It was esteemed as food by the ancient Romans, who fattened their snails in inclosures (*cochlearia*) made for the purpose, feeding them delicately on meal and boiled wine. It is still in esteem for the table in various parts of Europe, and is occasionally used in England. Nor is it the only species so used; the common garden-snails are probably equally good, though not so large, and ‘the glassmen at Newcastle once a year have a snail-feast; they generally collect the snails themselves in the fields and hedges the Sunday before the feast day.’—Turton’s *British Land and Fresh-water Shells*. Snails of different species are also an article of export on a small scale from England to the United States, packed in old casks, in which they are conveyed very well, fixing themselves one upon another to the cask, and leaving a vacant space in the centre. Snails boiled in milk are popularly regarded as a remedy for diseases of the chest, and for this purpose they are brought to Covent Garden market, London. If any benefit results from the use of them, it is probably due to their nutritious qualities.—Some of the tropical species of *Helix* are very large, and some have very beautiful shells.—For the many United States species, of which interesting collections may be formed, especially in limestone regions, see W. G. Binney’s works, pub. by the Smithsonian Institution. The shells are prepared by scalding, and drawing forth the dead animal by help of a bent pin.

SNAKE.

SNAKE, n. *snāk* [AS. *snaca*; Icel. *snakr*; Dan. *snog*; Sw. *snok*; Skr. *naga*, a snake: Gael. *snàig*, to crawl, to creep: AS. *snícan*, to creep]: creeping reptile (see below): V. among *seamen*, to wind a small rope round a large one in the spaces betwixt the strands. **SNA'KING**, imp. **SNAKED**, pp. *snākt*. **SNAKY**, a. *snā'kī*, resembling a snake, or pertaining to one; winding; sly; insinuating; deceitful. **SNA'KISH**, a. *-kīsh*, having the qualities of a snake. **SNAKE-BIRD** (see **DARTER**). **SNAKE-BITES** (see **VENOMOUS BITES AND STINGS**). **SNAKE'S-HEAD**, *formerly*, in *Amer.*, a piece of strap iron, used on the earliest railways, which being sometimes curled up on one end was liable to be caught over a wheel and to wreck the car: bars have long since taken the place of thin straps. **SNAKE-ROOT**, familiar name of several plants; the root of the *Polyg'ūla senēga*, or senega-root, ord. *Polygalācēæ*, so named from the supposition that it is an antidote to the bite of the rattlesnake (see **POLYGALA: ARISTOLOCHIA**). **SNAKE-STONE**, a familiar name for the fossils called ammonites; a mottled or spotted whetstone found in Scotland, and also called Ayrstone, as found chiefly on the banks of the river Ayr. **SNAKE-WEED**, the plant *Bistort* (q.v.), named from the double twist of its root. **SNAKE-WOOD**, wood of red hazel color, with numerous black spots and marks, very beautiful, and scarce (see **LETTER-WOOD**); a wood, supposed remedy for the bite of certain snakes. **SNAKE IN THE GRASS**, a secret enemy.

SNAKE: term synonymous with *Serpent* (q.v.).—Temperate N. America, e. of the Rocky Mts., has, of the not venomous family *Colubridæ* (see **COLUBER**), the following genera: *Eutenia*—Riband or Garter S., clear brown below the lateral stripe, found e. of the Alleghanies; Fairie's Garter S. of the Miss. valley, blackish below; Say's Garter S. of same region, similar, but the dorsal stripe brownish yellow; Hoy's, Mich. to Or., with three narrow yellow lines; the Common Garter S. or Striped S., olivaceous, with several varieties; and the Vagrant Garter S., ashy brown with 2 series of black side spots. *Pituophis*—Pine or Bull S., N. J. to O. and s., 5 ft., white with chestnut blotches bordered with black; and the Western Pine S., w. to Wis., 40–70 in., with many dark blotches. *Cyclophis*—Summer Green S., s. N. Y. to Ill., most abundant on mountains, the head conical. *Liopeltis*—Green S. or Grass S., chiefly n., having the dorsal scales smooth. *Bascanion*—the Common Black S. of the e. and s. *Coluber* (q.v.)—the Spotted Racer of Va. and s., length 50 in., red-brown with large red blotches; Pilot Racer, Mass. to Tex., 50–75 in., black with some scales white-edged; Fox S., Mass. to Kan. and n., 5 ft., light brown with square chocolate blotches; Emory's Racer, Ill. and s.w., ashy gray with transverse brown blotches; and the Chicken S., greenish yellow with two brownish stripes. *Diadophis*—the Black-necked S., U. S. generally, length 15 in., blue-black above, pale orange below; and Army's Ring-necked S., Ill. to Kan., spotted with black. *Ophiobolus*—Chain or Thunder S., Md. to La., 50 in., black with forked yellow lines inclosing black spots; its variety the King S., Alleghanies

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to Rocky Mts., n. to Ill., having many scales with whitish centre; the Milk or House S. (see MILK-SNAKE), miscalled Spotted Adder, Va. to Io. and n., gray with black-bordered spots and sagittate occipital spot; Kennicott's Chain S., Ill. to Kan., with square, notched, chestnut spots, and smaller lateral ones; and the Rhomb-marked S., Ill. to N. C. and s., chestnut with three series of rhomboidal blotches. *Cemophora*—the Crimson S., with black rings inclosing yellow rings, Md. to Kan. and s. *Osceola*—the Scarlet S., Va. to Fla., length 20 in., with black and white rings. *Farancia*—the Red-bellied Horn S., 36 in., s., and n. to Ill., blue-black with red side-spots. *Abastor*—Hoop S. or Red-lined S., n. to Ill., blue-black with three lateral red lines. *Haldea*—Brown S., Va. to Tex., 10 in., reddish above, salmon below. *Virginia*—Valeria Blaney's S., Md. to Ill. and s., 12 in., brownish red with black dots; and Kennicott's, Ill. and s.w., olive above, yellowish beneath. *Carphophiops*—Ground S., 12 in., Mass to Ill. and s., chestnut above, salmon below, head small; Helen Tennyson's S., Ill. to Miss., flesh-color beneath; and the Worm S., similar, but purplish black above. *Tropidonotus*—Water S., miscalled Water Adder, common, e. U. S., 30–50 in., brown with square blotches, or wholly dusky; the Southern Water S., with about 35 oblong red lateral spots; the Cyclopean S., s. Ill. to Fla., with alternating blackish bars; the Red-bellied S., Mich. to Kan. and s., copper-red beneath; Holbrook's Water S., Mich., s. and w., brown with about 50 square black-bordered spots. *Regina*—the Stiff S., 24 in., Penn. to Ga., greenish above, yellowish and spotted below; Leather S., e. U. S., 24 in., chestnut with 3 black dorsal stripes and yellow side-band; and Graham's S., Miss. valley, similar, but unspotted below. *Heterodon*—Blowing Viper or Hog-nose, e. U. S., 30 in., nose sharply recurved and keeled—harmless, like others of its family; and the Hog-nosed S., s., and n. to Ill., with 35 dorsal blotches. *Tropidoclonum*—Little Red or Kirtland's S., 8 in., e. to Ill. *Storeira*—Red-bellied S., 12 in., e. U. S., occiput with 3 pale blotches; and De Kay's Brown S., grayish below.

Of the venomous snakes, we have an *Elaps* (q.v.) (family *Elapidae*), the Harlequin or Bead S., length 30 in., Va. to Ark. and s., black with yellow-bordered crimson rings; but it seems to be harmless to man. Of the *Crotalidae* (q.v.) are the Northern Rattlesnake (*Crotalus*), e. and s., gradually becoming extinct (see RATTLESNAKE); the Massasauga or Prairie Rattlesnake (*Sistrurus*), 30 in., dark with about 7 series of chestnut blotches, sometimes wholly black, and less poisonous than the preceding; and the Diamond Rattlesnake, Va. to Miss. and s., brown, with 3 series of yellow-edged brown rhombs. Also two species of *Angkistrodon*—the Copperhead (q.v.) or Cotton Mouth, 35–40 in., e. U. S. chiefly, with Y-shaped blotches; the Black Moccasin, 25 in., southern Alleghanies, dusky with smoky-gray blotches, and tail black; and its variety, the Water Moccasin of the south (see MOCCASIN), 30 in., greenish above with dark

SNAKE-EEL—SNAKE RIVER.

bars.—See VENOMOUS BITES AND STINGS.—See *Jordan's Manual of Vertebrates of the Northern U. S.*, 5th edition.

The name COMMON S. is very generally given in England to a species very abundant in most parts of that country, and throughout Europe from s. Scandinavia to the Mediterranean. Its range extends also over great part of n. Asia. This species (*Natrix torquata* or *Tropidonotus natrix*) is known also as the Ringed S. and the Grass Snake. It belongs to the family *Colubridæ*. It grows to the length of four and even five ft., though specimens exceeding three ft. are rare. The female, as in serpents generally, is much larger than the male. The upper parts are grayish brown, tinged with green; at the back of the head are two crescent-shaped bright yellow spots, forming a kind of ring or collar; immediately behind these are two broad black spots, sometimes confluent. The skin, which may be shed four or five times during the year, is always thrown off by reversing it; so that the transparent covering of the eyes, and that of the scales also, are always found concave in the exuviae. Previously the whole cuticle becomes somewhat opaque, the eyes are dim, and the animal is evidently blind, also becomes more or less inactive, until, when the skin is ready to be removed, being everywhere detached, and the new skin perfectly hard underneath, the animal bursts it at the neck, and creeping through some dense herbage, or low brushwood, leaves it attached, and comes forth in brighter and clearer colors than before. A species of snake, *Coronella lævis* (see CORONELLA: SERPENTS), has been observed in England, long known as common in middle and s. Europe, called sometimes Austrian S., sometimes Smooth S., none of the scales being ridged or keeled as in the Common S. This S. is more similar to the viper in form and appearance than the Common S.: probably this has led to its being often mistaken for the viper, and its existence in England remaining long unnoticed. It attains a length of about two ft.; is of shining brown color, ornamented with checkered irregular patches of black; a yellow mark on the back and sides of the head; the lower parts yellowish, with square black spots. The head is not flattened as in the viper, but is narrowed in a similar way toward the neck.

SNAKE'-EEL: popular name of fishes forming the family *Ophisuridæ* of some naturalists; included by others, with all the eels, in family *Muraenidæ*, and distinguished by lack of a tail-fin, and the tail ending in a conical point like that of a serpent. They inhabit the seas of warm climates. One species, *Ophisurus serpens*, is found in the Mediterranean. It attains the length of about six ft., and the thickness of a man's arm; is brown above; silvery beneath, and has a slender and pointed snout.

SNAKE RIVER, or LEWIS FORK OF THE COLUMBIA, or SHOSHONE RIVER: great southern branch of the Columbia (q.v.): see also IDAHO.

SNAKE-STONE—SNAPDRAGON.

SNAKE'-STONE: small rounded piece of stone or other substance, reputed to be efficacious in curing snake-bites. A belief in their efficacy has been long and very widely diffused. Small perforated balls and rings of various kinds of stone, ivory, etc. strung together like beads, were formerly used as snake-stones in Scotland, being given to cattle to chew when they were bitten by vipers. Of course they could be expected to act only as a kind of charm. Many of the snake-stones used in India and the further east seem of no greater value. Some, however, appear to be really efficacious, being applied to the wound and absorbing blood from it with the poison before it has entered the system: remarkable instances are related of speedy cures thus effected. The S.-S. adheres for a short time to the wound, and then falls off. The wounded limb is meanwhile rubbed downward. Two small snake-stones, each the size of a large pea, brought from India, and believed to have cured a man bitten by a cobra, were found by Mr. Quekett to be composed of some vegetable matter. Sir James Emerson Tennent brought from Ceylon three snake-stones that had long been employed for the cure of snake-bites. On being analyzed by Faraday, one proved to be a piece of animal charcoal or charred bone; another was chalk, the third was of vegetable matter, and resembled a Bezoar-stone (q.v.) (compare MAD-STONE).

SNAP, v. *snǎp* [Dut. *snappen*; Ger. *schnappen*, to snap; Sw. *snabb*, quick (see also SNACK)]: to catch at suddenly, as with the teeth; to break short or at once; to try to seize; to break without bending; to utter sharp words: N. a sudden eager bite; a breaking short without bending; a sharp noise, as from the sudden breaking of a body; a catch or small lock, closed and opened by pressure; a small, circular, thin, and crisp cake of gingerbread to form one bite or mouthful. **SNAP'PING**, imp. **SNAPPED**, pp. *snǎpt*. **SNAP'PER**, n. *-pér*, one who or that which snaps. **SNAP'PISH**, a. *-pǐsh*, eager to bite; peevish; apt to speak tartly or in anger; crabbed. **SNAP'PISHLY**, ad. *-lǐ*. **SNAP'PISHNESS**, n. *-nēs*, the quality of being snappish; tartness. **SNAPPY**, a. *snǎp'pǐ*, tart and ill-natured; peevish. **SNAP-DRAGON**, plant of several species having showy flowers, somewhat resembling the faces of animals (see below): a Christmas game, the chief feature in which is snatching raisins from burning brandy. **SNAP-LOCK**, a lock shutting with a catch or snap. **TO SNAP AT**, to attempt to bite, as a dog; to snarl at; to snub. **TO SNAP OFF**, to break suddenly; to bite off suddenly. **TO SNAP ONE UP**, to treat with sharp words suddenly. **TO SNAP UP**, to snatch greedily; to gobble up.

SNAPDRAGON *snǎp'drǎg-on* (*Antirrhinum*): genus of plants of nat. order *Scrophulariaceæ*, consisting of annual and perennial herbaceous plants, natives chiefly of temperate parts of the n. hemisphere. They have the calyx 5-parted; the corolla swollen at the base, but without a spur, and *personate* (Lat. *persona*, a mask) i.e., its mouth closed by pressure of the lower against the upper lip; and the fruit

SNAPHANCE—SNATHE.

is a 2-cell oblique capsule, opening by three pores at the apex. The English name refers to a peculiarity of the corolla, whose lower lip if forcibly parted from the upper, so as to open the mouth, shuts with an elastic spring or snap. Some of the species have very pretty flowers. *A. majus* in many fine varieties has long been a favorite in gardens.

SNAPHANCE, *snăp'hăns* [Dutch *snap*, *snap*, *haan*, cock]: spring-lock of a musket or pistol; hence the name of a form of musket used in the 17th and first half of the 18th c., called also *Asnaphan*: see **LOCK**.

SNAP'PING-TUR'TLE: see **TORTOISE**: also **TURTLE**.

SNAR, v. *snâr*: OE. for **SNARL**.

SNARE, n. *snâr* [Dut. *snaar*; Icel. *snara*; Dan. *snare*, a cord: Fris. *snar*, a noose: Ger. *schnur*; Sw. *snöre*, a string]: a line or string with a running noose to catch small animals, as hares or rabbits; a net; a trap; that which may entangle or bring into trouble: V. to entrap; to entangle; to bring into unexpected evil. **SNAR'ING**, imp. **SNARED**, pp. *snârd*. **SNARER**, n. *-ër*, one who snares. **SNAR'Y**, a. *-î*, entangling; insidious.

SNARL, v. *snârl* [Low Ger. *snarren*, to whirr like a spinning-wheel, to grumble: Ger. *schnarren*, to make a harsh noise like a rattle or a string jarring: Icel. *snörgl*, a rattling sound in the throat]: to growl, as an angry or surly dog; to utter grumbling sounds; to speak roughly or sharply: N. the suppressed noise made by an angry or surly dog; a low subdued growl. **SNARLING**, imp. *snârl'ing*: **ADJ.** growling; snappish; pceevish. **SNARLED**, pp. *snârl'd*. **SNARLER**, n. *snârl'ër*, a surly grumbling fellow.

SNARL, v. *snârl* [Icel. *snara*, to twist]: in *OE.*, for **EN-SNARL**, to twist silk; to entangle; embarrass: N. entanglement; difficulty.

SNARY: see under **SNARE**.

SNATCH, v. *snăch* [from **SNACK**, which see]: to catch at quickly and eagerly; to snap up; to seize abruptly without permission or ceremony; to attempt to seize hastily or suddenly: N. a hasty catching or seizing, or an attempt to do so; a short fit of vigorous action; a short fit or turn; a small part of anything; a broken part; broken or interrupted action; in *OE.*, a shuffling answer; a quip.



Snatch-block.

SNATCH'ING, imp. **SNATCHED**, pp. *snăcht*. **SNATCHER**, n. *snăch'ër*, one who snatches. **SNATCH'INGLY**, ad. *-lî*. **SNATCH-BLOCK**, among *seamen*, a pulley having an opening in one side for receiving the bight of a rope. —**SYN.** of 'snatch, v.': to catch; pull; drag; twitch; pluck; grasp; gripe; seize.

SNATH, n. *snăth* [AS. *snad*—from *snidhan*, to cut]: helve of a scythe.

SNATHE, n. *snăth*: the helve of a scythe: V. to lop, to prune.

SNEAK—SNEEZE.

SNEAK, v. *snēk* [AS. *snīcan*; Swiss, *schnäken*; Gael. *snàig*, to creep, to crawl. Dan. *snige*, to sneak, to slink]: to steal away privately; to withdraw meanly, as if afraid or ashamed to be seen; to slink; to act with meanness or servility; to truckle; in *OE.*, to hide; to conceal: N. a mean truckling fellow; a mean servile time-server. **SNEAK'ING**, imp.: **ADJ.** mean; crouching; servile. **SNEAKED**, pp. *snēkt*. **SNEAK'ER**, n. a mean spiritless fellow; a sneak; in *OE.*, a small vessel of drink; a punch-bowl. **SNEAK'INGLY**, ad. *-lī*. **SNEAK'-CUP**, n. *-kūp*, one who sneaks from his cups; a toper who balks his glass, hence a mean, sneaking, paltry person. **SNEAK-UP**, same as **SNEAK-CUP**.

SNEAP, v. *snēp* [Dut. *snippen*, to nip: Dan. *snibbe*, to reprimand: prov. Dan. *sneve*, to clip: Norw. *snikka*, to cut (see **SNUB**)]: in *OE.*, to nip with cold; to rebuke; to cut short; to reprimand: N. a rebuke; a reprimand. **SNEAP'ING**, imp. **SNEAPED**, pp. *snēpt*.

SNEB, v. *snēb* [see **SNEAP**]: in *OE.*, to rebuke; to chide. **SNEB'ING**, imp. **SNEBBED**, pp. *snēbd*.

SNECK, n. *snēk* [probably connected with **SNAP**]: in *Scotch*, a latch: also **SNICK** and **SNIB**.

SNEE'HÄTTEN: see **NORWAY**.

SNEEK, *snāk*: prosperous trading and manufacturing town in the Netherlands, province of Friesland, 13 m. s.s.w. of Leeuwarden. It is built in the form of an irregular triangle, has three canals, and good water-way to the sea. Rich meadow-lands, in some places tending to be marshy, surround the town; and in the neighborhood is a considerable lake, the Sneekermeer. S. is the largest butter and cheese market in the province; the quantity sold reaching 5,000,000 lbs. of butter, and 2,250,000 lbs. of cheese annually. The principal buildings are the Reformed Church, Town-house, Bapt. Church, and Jewish synagogue. Pop. (1880) 10,500; 7,000 Reformed, and 1,450 Rom. Catholics, the remainder chiefly Baptists, except 150 Jews.

SNEER, v. *snēr* [Dan. *snærre*, to grin like a dog: Low Ger. *snarren*, to mutter, to grumble]: to show contempt by a particular expression of the countenance, as by turning up the nose; to speak or utter with grimace: N. the manifesting of contempt by turning up the nose or laughing ironically; a look of disdain or ridicule. **SNEER'ING**, imp.: **ADJ.** manifesting contempt by turning up the nose, or by a significant look. **SNEERED**, pp. *snērd*. **SNEER'INGLY**, ad. *-lī*. **SNEER'ER**, n. *-ēr*, one who sneers.—**SYN.** of 'sneer, n.': scoff; gibe; grimace; scorn.

SNEEZE, v. *snēz* [Dut. *niesen*; Ger. *niesen*, to sneeze: O. Icel. *hniosa*, to sneeze—said of cattle: Dan. *snuse*, to sniff: Gael. *snaois*; Scot. *sneeshin*, snuff]: to send forth a sudden and violent rush of air, through the mouth and the nose, by a convulsive effort, caused by irritation of the inner membrane of the nose: N. the act of throwing out from the nose and mouth, by a convulsive effort, a violent

SNEEZE-WOOD—SNIDER RIFLE.

and sudden rush of air. SNEEZ'ING, imp.: N. a sudden and violent rush of air, chiefly from the nostrils. SNEEZED, pp. *snēzd*. SNEEZEWORT, a plant having a strong pungent smell; the *Achillēa ptārmicā*, ord. *Compositæ*.

SNEEZE'-WOOD [Dutch of s. Africa, *nieshout*, from *niezen*, to sneeze, and *hout*, wood], (*Pteroxylon utile*): tree of nat. order *Sapindaceæ*, native of s. Africa, common in e. districts of Cape Colony. The timber rivals mahogany in beauty, takes fine polish, is very solid, strong, and durable. It receives its name from the sternutatory properties of its sawdust, by which workmen are often much annoyed.

SNELL, n. *sněl* [etym. doubt.]: a short line of horsehair, gut, etc., by which a fish-hook is attached to a line; a snood.

SNELL, a. *sněl* [AS. *snel*, quick, active]: in *OE.*, alert; brisk; in *Scot.*, biting; severe; sharp; cold, as wind.

SNELL EXHIBITIONS: scholarships founded 1677 by John Snell of Uffeton, Warwick, England, for the education of Scottish students at the Univ. of Oxford. Snell was born in the parish of Colmonell, in Ayrshire, 1629, and entered the Univ. of Glasgow 1644, and removed to England, where he held legal offices. He died at Holywell, near Oxford, 1679, leaving his estate for the foundation of the scholarships (now 14) which bear his name. The exhibitors, nominated by the College of Glasgow, receive about £110 annually each during five years: candidates must be natives of Scotland, or sons of fathers born in Scotland; there are other conditions. The list of exhibitors includes many eminent names.

SNIATYN, *snē-á'tēn*: town of Galicia, Austrian Poland on the Pruth, and on the Lemberg-Czernowitz railway; formerly a frontier stronghold. It has tanneries, and considerable trade in cattle and horses. Pop. (1881) 10,832.

SNIB, v. *snīb* [Dan. *snibbe*, to reprimand (see SNEAP)]: in *OE.*, to check; to nip; to reprimand; in *Scot.*, to fasten a door with a bolt: N. in *Scot.*, a small bolt to fasten a door. SNIB'ING, imp. SNIBBED, pp. *snībd*.

SNICK, v. *snīk* [Norw. *snicka*, to cut, to work with a knife]: in *OE.*, to make a small cut or mark: N. a small cut or mark as with a knife; a latch. SNICK'ING, imp. SNICKED, pp. *snīkt*. SNICK AND SNEE, a Flemish combat with knives.

SNICKER, v. *snīk'ēr* [Scot. *nicker*, to neigh, to laugh in a loud ridiculous manner; *snocker*, to breathe high through the nostrils—an imitative word]: to laugh with broken half-suppressed catches of voice: N. a half-suppressed broken laugh. SNICK'ERING, imp. SNICK'ERED, pp. *-ērd*.

SNID'ER RI'FLE: breech-loading firearm, the principle of which was applied (1867) to the Enfield rifle, then in use in the British army. The breech mechanism consists of a simple block containing an oblique needle; the block, being hinged on the right side, is opened by means of a thumb-piece. The cartridge, first of paper, afterward of

SNIFF—SNIPE.

thin sheet-brass, with detonator in the base, is inserted in the breech, and the latter is then closed. The rifle is discharged by pulling a trigger, which, by releasing a hammer, drives the needle into the base and explodes the detonator.

SNIFF, v. *snĭf* [Dan. *snive*, to sniff: Sw. *snyfta*, to sob (see **SNUFF**)]: to draw air audibly up the nose; to scent or smell: N. the act of sniffing; perception by the nose; the sound produced by sniffing. **SNIFFING**, imp. **SNIFFED**, pp. *snĭft*. **SNIFT**, v. *snĭft*, to snort. **SNIFTING**, imp. **SNIFT'ED**, pp. **SNIFTING-VALVE**, the escape-valve of a steam-engine. **SNIFFLE**, v. *snĭf'fl*, to snuffle, as one does with a severe cold in the head affecting the nostrils.

SNIGGER, v. *snĭg'gèr*: a form of **SNICKER**, which see.

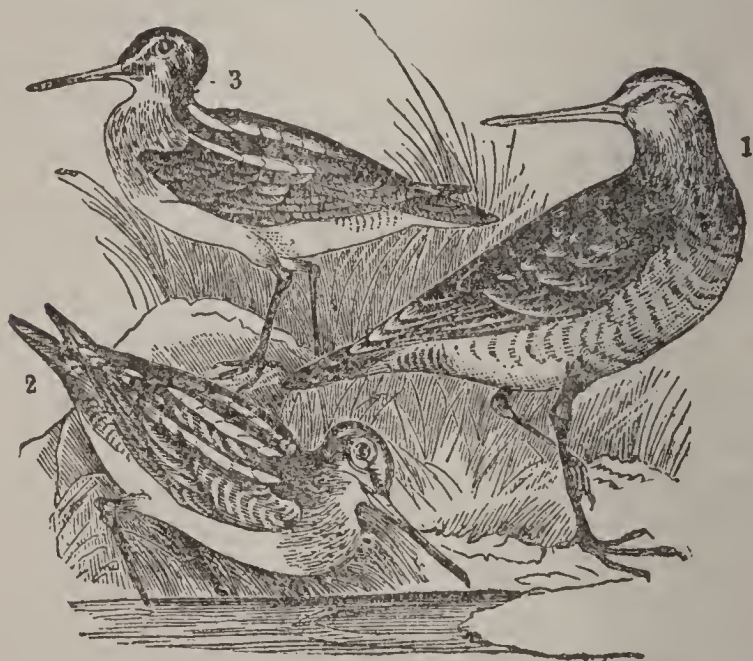
SNIGGLE, v. *snĭg'gl* [AS. *snĭcan*, to creep (see **SNAKE**)]: to fish for eels by thrusting the bait into their holes; to catch; to snare. **SNIG'GLING**, imp. *-glĭng*. **SNIG'GLED**, pp. *-gld*. **SNIG**, n. *snĭg*, in prov. *Eng.*, an cel.

SNIP, v. *snĭp* [Dut. *snippen*, to snip or clip: Ger. *schnippen*, to snap—an imitative word, representing the sharp click of a pair of blades]: to cut off at once, as with scissors; to clip; to cut into small pieces; to snap: N. a single cut; a bit cut off; a small shred; *familiarly*, a tailor. **SNIP'PING**, imp. **SNIPPED**, pp. *snĭpt*. **SNIP'PER**, n. *-pèr*, one who snips. **SNIP-SNAP**, a conversation carried on in tart quick replies.

SNIPE, n. *snĭp* [Icel. *snipa*; Dut. *snepe*; Ger. *schnepfe*, a snipe: Low Ger. *snippe*, a beak: Dut. *snappen*, to snap]: bird frequenting marshy places, and having a long slender bill; *figuratively*, a fool; a simpleton.—Snipe are several genera of birds of family *Scolopacidæ* (q.v.), having very long straight bill, with nasal grooves extending almost to the tip, which expands a little, the upper mandible slightly exceeding the lower in length—the whole bill soft and very sensitive, smooth and shining in the living bird, but soon after death becoming pitted like the end of a thimble by drying. The head is compressed; eyes are large, and in true snipe, as in woodcock, far back in the head—an evident adaptation to the mode of life, enabling the bird to guard against danger while its bill is plunged in the mud. The feet have three toes before, divided to the base or else edged by membrane, the hind-toe short. The tail is short. The true S. receive the generic name *Gallinago*, and are distinguished from all their congeners named Sandpipers (except several feather-legged species) by toes cleft to the base, outer primaries not emarginate, tarsus shorter than middle claw, and tibiæ naked below.—The **ENGLISH** or **EUROPEAN** S. (*Gallinago media*) is about 11 inches in entire length, the bill almost 3 inches. The sexes are alike in plumage, but the female is rather larger than the male. The general color of the upper parts is blackish brown, finely mixed with pale brown and with rich buff color; three pale brown streaks along the head; the neck and breast pale rust color mottled with black; the belly white. The tail consists of 14 feathers. The S.,

SNIPE.

when flushed, changes its course several times in a zigzag manner in the air, and then darts off very swiftly, so that young sportsmen find it a very difficult bird to shoot. The S. makes a very inartificial nest of a little dry herbage, in a depression of the ground, or sometimes in a tuft of grass or rushes. The eggs are four in number, pale yellowish or greenish white, the larger end spotted with brown. This species is plentiful in all moory and marshy parts of Britain, and generally throughout Europe, also in parts of Asia; and it is found in n. Africa, and in Greenland. It breeds in Britain, even in s. England, though many of the snipes which spend the winter in Britain migrate n. in spring. The S. is capable of being tamed, and becomes very



1, Solitary Snipe (*Gallinago major*); 2, Common Snipe (*Gallinago media*); 3, Jack Snipe (*Gallinago gallinula*).

familiar; but is difficult to keep because of the prodigious quantity of worms and like food which it requires. A tame S. has been known to eat nearly twice its own weight of worms in 12 hours. The S. is in high esteem for the table, and is included among game.—The habits of all the other species of S. correspond very nearly with those of the Common Snipe. The GREAT S., or SOLITARY S. (*G. major*), rare in Britain, abounds in the extensive marshes of continental Europe, and is found in Asia; entire length about $12\frac{1}{2}$ inches.—The AMERICAN S. (*G. Wilsoni*), otherwise called Jack S., and miscalled ‘English S.’ differs from the English S. in having the axillars (wing-lining near the body) regularly barred with white and blackish, instead of imperfectly, though it agrees in this feature with the Lesser European S. (*G. gallinula*), which, however, has 14 tail feathers, the outer but little shortened. Its length is $10\frac{1}{2}$ – $11\frac{1}{2}$ in., and bill about $2\frac{1}{2}$. It is common in open wet places in N. America generally; is migratory, breeding as far s. as the n. United States, and in winter spreading to S. America. Its nest is a hollow in grass or bog-moss. The

SNIPE-FISH—SNOOZE.

young are mottled with various colors, from white through yellow to dark brown.—The RED-BREASTED S. (*Macrorhamphus griseus*), known also as Brown-back, Dowitcher, Gray S. (winter plumage, as the red-breasted is the summer), comes under a genus with partly webbed toes, tail barred, and the bird less than 12 in. long. It has a bill like snipe, but is in other respects like a long-legged sandpiper. In summer the belly is whitish, the breast and sides dark-speckled. Its variety *G. scolopaceus* is not confined to the Atlantic coast; hence is called Western Dowitcher, also Red-bellied S., and Greater Long-beak. In summer the belly is cinnamon color, breast a little speckled, sides dark barred. Both are 10-12½ in. long, and bill 2-3.—The name Robin S. is sometimes given to the Red-breasted Sandpiper (*Tringa canutus*), largest of its own group; toes cleft to the base; and of world-wide distribution.

SNIPE'-FISH: see TRUMPET-FISH.

SNITE, v. *snīt* [see SNOT and SNOUT]: in *OE.*, to wipe the nose; to snuff, as a candle.

SNITE, n. *snīt* [see SNIPE]: in *OE.*, a snipe.

SNIVEL, v. *snīv'l* [from SNIFF, which see: Dan. *snövle*, to snuffle: Dut. *snuffelen*, to smell out]: to draw up the mucus audibly through the nose; to run at the nose with mucus: N. mucus running from the nose. SNIV'ELLING, imp. -*ling*: ADJ. running at the nose; crying; lamenting: N. a crying, as of children, with snuffling or whining. SNIV'ELLED, pp. -*ld*. SNIV'ELLER, n. -*lér*, one who weeps from trivial causes. SNIV'ELLY, a. -*lǝ*, dirty at the nose; pitiful: whining.

SNIZORT, LOCH, *lǝch snī'zért*: large picturesque inlet of the sea, in n.w. of the island of Skye (q.v.). At its head the loch is only a few furlongs broad, but gradually expands to more than seven m. at its entrance. It is 13 m. long.

SNOB, n. *snǝb* [prov. Eng. *snob*, an ignorant person, a journeyman shoemaker: Scot. *snab*, a cobbler: Icel. *snapr*, an idiot, an impostor]: a vulgar person who apes gentility; one who is always pretending to be something better; one who works for lower wages than other workmen, especially one who works in a shop out on strike; in *university slang*, a townsman. SNOB'BISH, a. -*bǝsh*, pertaining to or befitting a snob. SNOB'BISHLY, ad. -*lǝ*. SNOB'BISHNESS, n. -*nǝs*, the character or habits of a snob. SNOB'LING, n. a little snob. SNOB'BERY, n. -*bér-ǝ*, the manners or character of a snob.

SNOD, a. *snǝd* [Scot. *snod*, to prune, to put in order: Icel. *snúdr*, a twist, a twirl; *snua*, to twist: comp. Gael. *snuadh*, color, adornment]: in *Scot.*, trimmed; put in order; neat; demure. SNOOD, n. *snód*, in *Scot.*, the fillet or ribbon which binds up the hair among women.

SNOOZE, v. *snóz* [Lith. *snusi*, to doze: Bav. *pfnausen*, to breathe deep through the nose: Dan. *snuse*, to sniff]: to slumber; to nap; to doze: N. a comfortable short sleep; a nap. SNOOZ'ING, imp. SNOOZED, pp. *snǝzd*.

SNORE—SNORT.

SNORE, v. *snör* [O.Dut. *snorren*, to grumble, mutter: Swiss, *sc. modern*, to snore: Low Ger. *snurre*, the nose; *snurren*, to whirr like a spinning-wheel, to snore in sleep: Ger. *schnarchen*, to snore: Sw. *snor*, mucus from the nose]: to breathe through the open mouth in sleep with a rough hoarse noise: N. a hoarse rough breathing through the nose and mouth in sleep. **SNOR'ING**, imp. **SNORED**, pp. *snörd*. **SNOR'ER**, n. *-ér*, one who snores.

SNORRO STURLUSON, *snor'ro stór'lú-son* (*Snorri*, son of *Sturla*): learned historian and distinguished Icelandic politician: 1179-1241, Sep. 22; b. Hvamma, in Iceland, where his family, who traced their descent to the ancient kings of Norway and Sweden, had been settled since the early colonization of the island. S. S. was placed at an early age under the care of Jon Loptson, grandson of Sæmund Sigfusson, learned compiler of the old Edda, by whom he was instructed in the history, mythology, and poetry of the North, as well as in classical literature. By his marriage, at the age of 26, with a rich heiress, and the speedy death of his father, S. S. early attained wealth and influence, and by the choice of the people was elected supreme judge or chief magistrate of the island, as he was distinguished for profound knowledge of the laws and institutions of his country; but his ambition, avarice, and love of intrigue embroiled him in sanguinary feuds, and hastened the destruction of Icelandic independence. Needlessly taking part in the intestine troubles of Norway, S. S. excited the suspicion and ill-will of the Norwegian king, Hakon, who sent secret instructions to Iceland for his arrest; or, if need be, his assassination. Of these instructions the many enemies of S. S. availed themselves, and he was murdered in his own house.—S. S., as an author, had great critical sagacity, vigor in characterization, and life in narrative. His great work is the *Heimskringla*, or Mythic Ring of the World, sagas, in which he records the history of the kings of Norway from the earliest times to the death of Magnus Erlingsson 1177. It was compiled from ancient genealogical tables and other documents, was translated into Danish about 1559 by Peder Clauson, and published first by Olaf Worm (Cop. 1633). This translation has been repub. by Gruntvig (3 vols., Cop. 1818-22) and others. German, Swedish, and Latin versions also have been executed, and English (by Laing) 1844.—To S. S.'s authorship is referred the composition of the younger or prose Edda; and he is believed to have had a share in collecting and arranging the songs of the elder or poetic Edda: see **EDDA**.

SNORT, v. *snört* [from **SNORE**, which see]: to force the breath through the nose with violence and noise, as a horse in prancing and playfulness: N. a forcible blowing of air through extended nostrils, as a horse. **SNORT'ING**, imp. N. act of forcing air through the nose with noise. **SNORT'ED**, pp. **SNORT'ER**, n. *-ér*, one who snorts.

SNOT—SNOW.

SNOT, n. *snõt* [Low Ger. *snotte*; Dut. and Dan. *snot*; mucus of the nose]: the mucus discharged from the nose; a rude and vulgar person: V. *vulgarly*, to blow the nose. **SNOT'ING**, imp. **SNOT'ED**, pp. **SNOT'TY**, a. -*tĭ*, foul with mucus from the nose; *familiarly*, crabbed; peevish; sneering. **SNOT'TINESS**, n. -*tĭ-nĕs*, the state of being snotty. **SNOT'TER**, v. -*tĕr*, to snivel.

SNOTTER, n. *snõt'ĕr* [etym. doubt.]: in *naut.*, a rope passing over a yardarm, to bend a tripping line to, in sending down topgallant and royal yards in vessels of war; the short line supporting the heel of the sprit in a small boat.

SNOUT, n. *snowt* [Icel. *snudr*; Sw. *snut*; Bav. *schnud*; Low Ger. *snute*; Dan. *snude*; Dut. *snuit*, the snout]: the projecting nose of a beast; the human nose, in contempt; the nozzle of a pipe: V. to furnish with a nozzle. **SNOUT'ING**, imp. **SNOUT'ED**, pp.: **ADJ.** having a snout. **SNOUT'Y**, a. -*ĭ*, resembling a snout.

SNOW, n. *snō* [Ger. *schnee*; Icel. *sníór*; Dan. *snee*; Sw. *snō*; Goth. *snaivs*; Gael. *sneachd*; Gr. *nĭps* or *nĭpha*, snow]: congealed moisture or vapor of the atmosphere, in the form of light white flakes, of very beautiful and perfect forms (see below): V. to fall in snow; to scatter like snow. **SNOW'ING**, imp. **SNOWED**, pp. *snōd*. **SNOWY**, a. *snō'ĭ*, abounding with snow; white like snow; spotless; unblemished. **SNOW'ISH**, a. -*ĭsh*, resembling snow. **SNOW'LESS**, a. -*lĕs*, without snow. **SNOW BALL**, a round mass of compressed snow: V. to throw snow-balls; to pelt with snow-balls. **SNOW-BALL TREE** (see **GUELDER-ROSE**). **SNOW-BLANKET**, the name given by farmers and others to any considerable thickness of snow which covers the ground during winter. **SNOW-BLINDNESS**, an affection of the eyes, caused by the reflection of light from the snow. **SNOW-BLINK**: see **SNOW-LIGHT**. **SNOW-BROTH**, a mixture of snow and water; a very cold liquor. **SNOW-CAPPED**, a. covered with snow, as a hill or mountain. **SNOW-DRIFT**, a bank formed of snow driven together by the wind. **SNOW-FLAKE**, a flake or feathery particle of snow; plant (see below). **SNOW-LIGHT**, or **-BLINK**, the name given by voyagers and travellers in the arctic regions to the peculiar reflection which arises from field of ice or snow. **SNOW-LINE**, that line or limit of elevation at and above which the surface is perpetually covered with snow and ice (see below). **SNOW-PLOW**, machine for clearing railways and roads from accumulations of snow. **SNOW-SHOE**, a boat-like framework fastened on the foot to prevent sinking in deep snow (see **SNOW-SHOES**). **SNOW-SLIP**, a mass of snow which slips down the side of a hill or mountain. **SNOW-STORM**, a heavy, drifting fall of snow. **SNOW-WHITE**, a. very white. **SNOWWREATH**, an accumulation of snow of some length.

SNOW, n. *snō* [Low Ger. *snau*, a beak]: a vessel with two masts; a brig.

SNOW.

SNOW: frozen moisture which falls from an atmosphere whose temperature is 32° F. or lower. It is composed of crystals, usually in the form of six-pointed stars, of which about 1,000 different kinds have been observed, and many of them figured, by Scoresby, Glaisher, and others. These numerous forms have been reduced to the following five principal varieties—1. Thin plates, most numerous class, containing several hundred forms, of exquisite beauty (figs. 1 to 6). 2. A spherical nucleus or plane



Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

figure studded with needle-shaped crystals (fig. 8). 3. Six or, more rarely, three-sided crystals. 4. Pyramids of six sides (fig. 9). 5. Prismatic crystals, having at the ends and middle thin plates perpendicular to their length (fig. 7). The crystals in the same fall of snow are generally of the same form. The crystals of hoar-frost being formed on leaves and other bodies disturbing temperature, are often irregular and opaque; and it has been observed that each tree or shrub has its own peculiar crystals. S.-flakes vary from an inch to $\frac{7}{100}$ of an inch in diameter, the largest occurring when the temperature is near 32° , and the smallest at very low temperatures. As air has a smaller capacity for retaining its vapor as the temperature sinks, it follows that the aqueous precipitation, S. or rain, is much less in polar than in temperate regions. The white color of

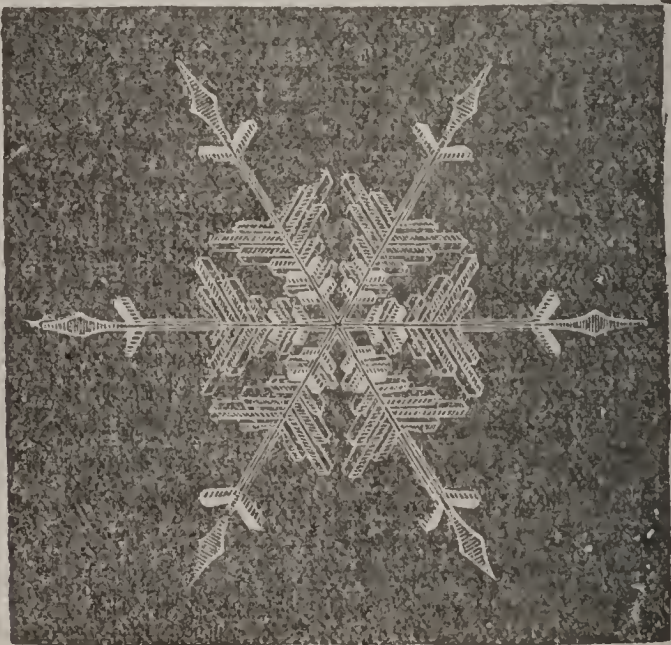


Fig. 5.

S. is the result of the combination of the different prismatic rays issuing from the *minute* snow-crystals. Pounded glass and foam are analogous cases of the prismatic colors

SNOW.

blending together and forming the white light out of which they had been originally formed. Also the air contained in the crystals intensifies the whiteness of the snow: see RED SNOW. The limit of the fall of snow near sea-level coincides nearly with the mean winter temperature of 52° F., since in places where the mean winter tempera-

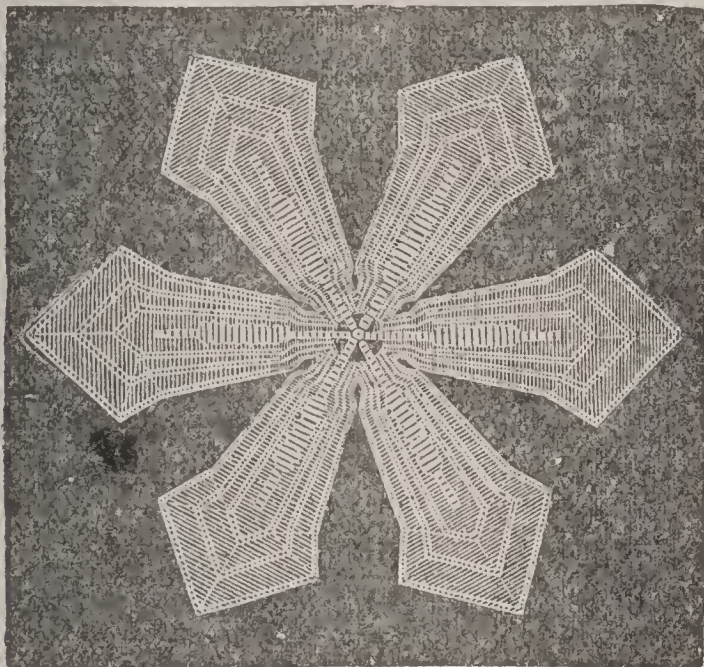


Fig. 6.

ture is no higher than 52° , that of the air falls sometimes to 32° . In N. America the s. S. limit is Savannah, New Orleans, the mouth of the Rio Grande, the head of the Gulf of California, and San Francisco: in Europe it is not far n. of Gibraltar. At Paris, S. falls, on an average, 12 days in a year; at St. Petersburg 170 days. In Charleston, S. C., the mean days of S. per year are 2, mouth of the

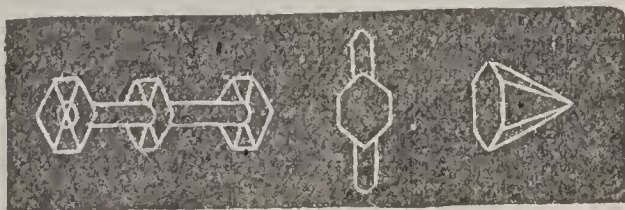


Fig. 7.

Fig. 8.

Fig. 9.

Columbia river 7, St. Louis 11, Cape Henry 13, Detroit 34, Winnipeg 54, Halifax 64, Quebec 66. The largest falls of S. are in the Antarctic regions. S. is 10 to 12 times lighter than an equal bulk of water. From its loose texture, and its containing about 10 times its bulk of air, it is a very poor conductor of heat, and thus forms an admirable covering for the earth from the effects of radiation—so that frequently, in times of great cold, the soil is 40° warmer than the surface of the overlying snow. The flooding of rivers from the melting of the S. on mountains in summer, carries fertility into regions otherwise barren. See SNOW-LINE: GLACIER: METEOROLOGY (and its references).

SNOWBERRY—SNOW-BUNTING.

SNOWBERRY (*Symphoricarpos racemosus*): bushy deciduous shrub of nat. order *Cuprifoliaceæ*, native of n. parts of N. America, on wild rocky banks, most common in w. and s. United States, and now common in British shrubberies. It has simple leaves and small white or somewhat rosy flowers, in interrupted leafy spikes, blooming all summer; berries about the size of black currants, remaining on the bush after the leaves, quite white, but uneatable.—The name **SNOWBERRY** is given also to the creeping Snowberry (*Chiogenes hispidula*) of peat-bogs and low woods in the n. United States; it has small evergreen leaves, rusty bristled below, and these and the berries have a wintergreen flavor.

SNOW-BIRD: name applied in the United States either to the Snow-bunting (q.v.), or to the much more common *Junco hiemalis*, which differs strikingly in being of dark slate color except the white belly, the slate color ending abruptly at the lower part of the breast. It occurs everywhere in N. America, in flocks, during the cold weather, when its summer song is reduced to a chirp. It makes itself at home in the vicinity of houses and in barnyards, taking refuge from extreme cold in haystacks or other shelter. There are other species of the same genus.—The name Snow-finch, though applicable to the Snow-bird and the Snow-bunting, is used for a European bird resembling the Snow-bunting, but of another genus; it is the *Montifringilla nivalis*, and is called also the Stone-finch or Mountain-finch.

SNOW-BUNTING, or **SNOW'FLECK** (*Plectrophanes nivalis*), also called Snow-flake, Snow-flight, etc.: bird of the Bunting family (*Emberizidæ*), of genus distinguished from



Snow-bunting (*Plectrophanes nivalis*).

true buntings by the long and nearly straight claw of the hind-toe, in this resembling the larks. There is an approach to larks in habits also; there is similar ease and celerity in running on the ground, and the song is very different from that of any of the true buntings. The S.-B. is white, with bill, back, and more or less of the wings and tail black or blackish, and often is varied with rich brown; abounds in summer in all parts of the arctic regions, and in winter in more s. countries of N. America, Europe, and Asia. Linnaeus says it is the only living creature that has been seen 2,000 ft. above the limits of perpetual snow on the mountains of Lapland. Great flocks are seen in Britain, particularly in severe winters, usually in uplands in mild

SNOWDON—SNOW-FLAKE.

weather, but descending to the low grounds and seashore in hard frosts. The nest is placed on the ground, or in a crevice of a rock.—The S.-B. is generally very fat, and highly esteemed for the table. The Greenlanders kill great numbers, and dry them for winter use.

SNOWDON, *snō'don*: mountain-range in Caernarvonshire, N. Wales; stretches n.e. by n. from a point 5 m. n. of Cricceith, near the head of Cardigan Bay, to near Conway; but broken by valleys and river-courses into four mountain groups, whose chief peaks are Carnedd-Llewelyn, 3,460 ft.; Moel-Siabod, 2,878 ft.; and *Moel-y-Wyddfa* ('the Conspicuous Peak'), highest mountain in s. Britain, 3,571 ft. above sea-level. Seen from the top, Moel-y-Wyddfa, the 'King of Snowdonia,' appears to send out three ridges, which gradually divide and sub-divide, giving birth to numerous valleys and corries. The ascent of the highest peak of S. is effected by tourists from Llanberis (on the n.), Beddgelert (on the s.), Llyn-Cwellyn (on the w.), and Capel Curig (on the e.); the first is shortest and easiest; the last is longest, most difficult, but far the grandest. The district of 'Snowdonia' was made a royal forest by Edward I. of England, but was disafforested 1649.

SNOW'DROP (*Galanthus*): genus of plants of nat. order *Amaryllideæ*, of same tribe with Amaryllis, Snowflake, Crinum, etc. The three outer segments of the perianth spread, so as to make a bell-shaped flower; the three inner are shorter, erect, and notched at the summit. The flowers arise from a spathe. The root is bulbous, and produces two leaves and one single-flowered leafless stem (*scape*). The Common S. (*G. nivalis*), is native chiefly of s. Europe, growing in woods and pastures. It has long been cultivated in gardens.—Another species of S. (*G. plicatus*), with much broader leaves, is found in s. Russia and in Asiatic Turkey.

SNOWDROP TREE, or SILVER-BELL TREE (*Halesia*): genus of trees or shrubs of the Storax family (*Styracaceæ*); named from the white bell-shaped flowers which appear before the leaves, and are mostly strung on drooping branches. *H. tetraptera*, found on streams as far n. as the Ohio river, is hardy in cultivation; it has four-winged fruit. *H. diptera* has the leaf-serrations coarse, and the fruit two-winged; it flourishes only at the south, in lowlands.

SNOW-FLAKE (*Leucoium*): genus of European plants, introduced from Europe and cultivated in gardens. It resembles much the Snowdrop, but is larger, flowers late, with the flower-stalk more leafy at the base, and the leaves bright green. The spring S.-F. (*L. vernum*) is one foot high and one-flowered, with a hexagonal pear-shaped pod. The Summer S.-F. (*L. æstivum*) has 3-7 larger flowers, with rounder pod.

SNOW-LINE.

SNOW'-LINE: limit of height above sea-level below which all the snow that falls annually melts during summer; higher than this line is the region of perpetual snow. No general rule for the height of this line can be given, owing to the different causes which may determine it. These are—distance from the equator; situation of the slope in respect of the sun's rays, whence, other things being equal, the S.-L. is (in n. latitudes) higher on the s. than on the n. side of mountains; situation with respect to rain-bringing winds; steepness of the slope; and dryness or humidity of the region. Nevertheless, it may be said generally that the S.-L. sinks little from the equator to lat. 20° n. or s.; from 20° to 70° it continues to fall equally; but from 70° it falls rapidly to 78° , where it is at sea-level.

To this general statement there are important exceptions. The S.-L. is about 4,000 ft. higher on the n. than on the s. side of the Himalaya, owing to the greater depth of snow that falls on the s. side; to the greater dryness of the climate of Tibet, which increases the evaporation and the heating power of the sun's rays; and to the naked rocks and soil of the n. absorbing more heat than surfaces covered with vegetation. It is higher in the centre of continents than near the coasts (the rain being less, and the heat greater), as seen on comparing the Pyrenees and Caucasus; and on the e. than on the w. coasts of continents, which is strikingly illustrated by Kamtchatka (S.-L. 5,249 ft.) and Unalashka (3,510), situated respectively on the w. and e. coasts of the n. Pacific. S. of the equator, it rises from 0° to 18° very considerably, and more so on the w. than on the e. of the Cordilleras, owing to the small amount of rain and snow which falls on the w. of these mountains. It is as high in 33° s. lat. as in 19° n. lat.; but s. of this it sinks very rapidly, so that in the s. of Chili it is 6,000 ft. lower than in the same lat. in the Rocky Mountains, and 3,000 lower than in w. Europe. The mean temperature of the S.-L. varies much from the equator to the pole—from 35° to 20° F. In the Alps, it is about 25° ; and in Norway, about 23° .

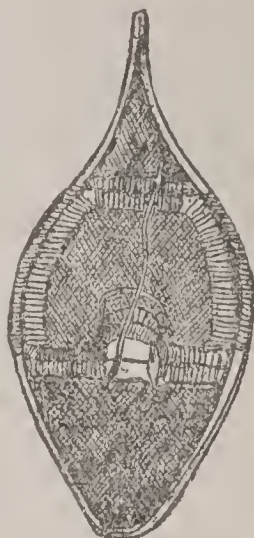
The following are the observed heights of the S.-L. in Eng. ft., in different parts of the globe:

| | N. Lat. | Height. |
|-----------------------------|------------------|---------|
| Spitzbergen..... | 78 | 0 |
| Sulitelma, Lapland..... | 67 | 3,835 |
| Kamtchatka..... | 59 $\frac{1}{2}$ | 5,249 |
| Unalashka, W. America..... | 56 $\frac{1}{2}$ | 3,510 |
| Altai..... | 50 | 7,034 |
| Alps..... | 46 | 8,885 |
| Caucasus..... | 43 | 11,063 |
| Pyrenees..... | 42 $\frac{3}{4}$ | 8,950 |
| Rocky Mountains..... | 43 | 12,467 |
| North Himalaya..... | 29 | 19,560 |
| South Himalaya ... | 28 | 15,500 |
| Mountains of Abyssinia..... | 13 | 14,065 |
| Purace, Colombia..... | 2 $\frac{1}{2}$ | 15,281 |

SNOW-SHOES—SNUFF.

| | S. Lat. | Height. |
|-------------------------|---------|---------|
| Nevados of Quito..... | 0 | 15,820 |
| Arequipa, Bolivia..... | 16 | 17,717 |
| Paachata, Bolivia..... | 18 | 20,079 |
| Portillo, Chili..... | 33 | 1,473 |
| Cordilleras, Chili..... | 42½ | 6,010 |
| Magellan Strait..... | 53½ | 3,707 |

SNOW'-SHOES: species of foot-gear much used by inhabitants of regions where snow prevails for a great portion of the year. The Canadian snow-shoe consists of a flat frame, of lanceolate form (see fig.), 1-2 ft. wide and 3-5 ft. long. It is either wholly of wood, or is a long narrow frame of pliable hickory, placed on edge, bent double with oval front and the two ends firmly fastened behind, filled in with wicker-work or thongs, and with cross-straps on the upper surface to attach it to the foot. The broad surface prevents the foot from sinking in the snow. The Norwegian snow-shoe is a thin board 5-10 ft. long, 3 in. wide, with the fore end slightly curved upward.



Snow-shoe.

SNUB, v. *snüb* [Dan. *snibbe*, to reprimand: Icel. *snubba*, to cut short: Sw. *snubba*; Fris. *snubbe*, to give a sharp reproof]: to check; to reprimand; to rebuke, particularly in a sarcastic manner; to slight; to treat with contempt; to nip. **SNUB'BING**, imp.: N. a sarcastic reprimand or rebuke. **SNUBBED**, pp. *snübd*. **SNUB NOSE**, a short or flat nose.

SNUDGE, v. *snüj* [a form of **SNUG**, which see]: in *OE.*, to lie idle, close, or snug. **TO SNUDGE ALONG**, to walk looking downward with a poring, abstracted air. **TO SNUDGE OVER THE FIRE**, to keep close to it.

SNUFF, v. *snüf* [O.Dut. *snuffen*, to breathe through the nose, to trace by scent: Ger. *schnaufen*, to snuff, to puff and blow: Low Ger. *snuffe*, the nose]: to draw in with the breath through the nose; to inhale; to perceive by the nose; to take off the burnt top of a candle; to inhale breath audibly; to draw up into the nostrils the powder of tobacco-leaf; to snift with the nose in contempt: N. that which is inhaled or drawn up through the nostrils; the charred end of a wick; a candle almost burnt out; tobacco-leaf reduced to powder for drawing up into the nostrils (see **TOBACCO**): resentment expressed by sniffing or snorting. **SNUF'ING**, imp. **SNUFFED**, pp. *snüft*. **SNUF'FER**, n. *-fër*, one who snuffs. **SNUF'FY**, a. *-fi*, soiled with snuff, or smelling of it. **SNUF'FERS**, n. plu. *-fërz*, an instrument for taking off the charred wick of a candle. **SNUFF-BOX**, a small box or case for holding snuff intended for daily use. **UP TO SNUFF**, *familiarly*, not likely to be imposed upon; knowing; acute. **SNUFFED OUT**, overshadowed; eclipsed; put down: annihilated.

SNUFFLE—SO.

SNUFFLE, v. *snǔffl* [from **SNUFF**, which see: Dut. *snuffelen*, to breathe through the nose: prov. Ger. *schnuffeln*, to speak through the nose, to snuffle]: to speak through the nose; to breathe hard through the nose, especially when obstructed by mucus. **SNUF'FLING**, imp. *-fling*: N. a speaking through the nose. **SNUF'FLED**, pp. *-fld*. **SNUF'FLER**, n. *-flər*, one who snuffles. **SNUF'FLES**, n. plu. *-flz*, obstruction of the nose by mucus.

SNUG, a. *snüg* [Icel. *snöggr*, smooth, as wool or hair: Dan. *snög*, *snyg*, smart, neat: Sw. *snygg*, neat, cleanly]: warm and close; sheltered; concealed; not exposed to view; being in good order; neat and comfortable: V. to lie close or concealed. **SNUG'GING**, imp. **SNUGGED**, pp. *snügð*. **SNUGLY**, ad. *snüg'li*. **SNUG'NESS**, n. *-nēs*, the state of being snug. **SNUG'GERY**, n. *-gēr-ĭ*, a neat comfortable place. **SNUG'GLE**, v. *-gl*, to lie close; to nestle or cuddle. **TO BE** or **LIE** **SNUG**, to be close; to be slyly and comfortably concealed.

SNY, n. *snī* [comp. Dan. *snoe*, to twist]: among *ship-carpenters*, the upward bend of a ship's timbers toward the bow and the stern. **SNYING**, n. *snī'ing*, a term for a circular plank worked edgewise into the bow of a ship.

SNYDERS, or **SNEYDERS**, *snī'dérz*, FRANCIS: Belgian painter of animals and still-life: 1579–1657; b. Antwerp. His style was formed in the school of Henry van Baelen. Originally, he confined himself exclusively to painting fruits, and worked with Rubens. In his pictures, with figures by Rubens, Jordaens, Honthorst, and Mierevelt. it is difficult to discover any difference of touch. For Philip III. of Spain he executed several hunting and battle pieces. S. knew how to give expression to the passions of the lower creation, and his bear, wolf, and boar fights are scarcely surpassable. The best specimens of the artist are in the galleries of Vienna, Munich, and Dresden; there are fine pictures of his in private English collections also. S. died at Antwerp.

SO, ad. conj. *sō* [Icel. and Goth. *sva*; AS. *swd*; Ger. *so*; F. and It. *si*; L. *sic*, so: Gael. *so*, this or these; *so*, a prefix signifying facility, ease, goodness]: in like manner, when preceded or followed by *as*; in such manner, when followed by *that*; in this way, when followed by *as*; for this reason; this or that, as, I said *so*; thus; thus it is; provided that; in a high degree, as, he was *so* good; very, as, I am *so* sorry; as it appears, as, *so* you are going. **SO FORTH**, more of a like kind. **So so**, a familiar exclamatory phrase; well, well, implying discovery or observation; moderately or tolerably well; mediocre. **So THAT**, to the end that. **So THEN**, therefore; the consequence is. **So AND so**, used in speaking of a person, place, or thing to avoid identification. *Note.*—So sometimes repeats the sense of a word or sentence going before, as, 'to make men happy, and to keep them *so*'—that is, happy.

SOAK—SOAP.

SOAK, v. *sōk* [AS. *sucan*, to soak: W. *swga*, soaked: Manx, *soo*, to suck up: Gael. *sùg*, to suck: Ger. *sogen*, to drip]: to cause to suck in wet or moisture; to steep; to wet thoroughly; to lie steeped in a liquor; to enter gradually into pores or interstices. **SOAK'ING**, imp.: **ADJ.** that wets thoroughly; drinking intemperately: **N.** a thorough wetting. **SOAKED**, pp. *sōkt*. **SOAK'ER**, n. *-ér*, a hard drinker. **SOAK'AGE**, n. *-āj*, state of being soaked. **SOAK'Y**, a. *-ī*, moist on the surface; full of moisture.

SOAP, n. *sōp* [Dut. *zeep*; Icel. *sápa*; Gael. *siabunn*; Dan. *sæbe*; Ger. *seife*; It. *sapone*; W. *sebon*; F. *savon*; L. *sapo*; Gr. *sapōn*, soap: Bret. *soav*, tallow]: an important article of household use, manufactured from oils or fats, and an alkali, as soda or potash: **V.** to rub with soap. **SOAP'ING**, imp. **SOAPED**, pp. *sōpt*. **SOAPY**, a, *sōp'ī*, smeared with soap; resembling soap. **SOAP'INESS**, n. *-ī-nēs*, the quality of being soapy. **SOAP-BARK**, bark of *Quillaja saponaria* (see **SOAPWORT**). **SOAP-BOILER**, one whose trade is to make soap. **SOAP-BOILING**, the trade of making soap. **SOAP-BUBBLE**, a spherical film or air-bubble which floats in the air for a brief space, produced by blowing soapy water through a tube, as a tobacco-pipe. **SOAP-ROOT** (see **SOAPWORT**). **SOAPSTONE**, n. a soft variety of magnesian rock having a soapy feel (see **STEATITE**). **SOAP-SUDS**, water well impregnated with soap. **SOFT-SOAP**, a semi-fluid soap of a dirty brownish-yellow color, made with potash instead of soda.—*Soap* is a chemical compound resulting from union of fatty oils and fats with alkaline bodies.

According to Pliny, S. became known to the Romans by their conquest of Gaul. It is mentioned in the English version of the Bible; but it is believed that the words *borith* and *nether*, there rendered soap, really mean potash and soda.

The *chemical composition* of S. is as follows: The fixed fatty bodies, stearine, palmitine, and oleine, when heated with alkaline solutions, undergo the remarkable change *Saponification*, or conversion into S., during which process the fats yield a clear viscid liquid, which, from its sweetness, is termed *Glycerin* (q.v.). The nature of this change may be ascertained by decomposing the S. thus formed, which exists as a homogeneous transparent mass, freely soluble in warm water, by the addition of some acid, such as tartaric or hydrochloric, which combines with the alkali, and forms a soluble compound with it. A fatty matter separates in flakes, which melt on the application of heat, and form an oily layer on the surface of the fluid. This substance, when cold, is found to be very different from the original fat. It has acquired a strongly acid reaction, as may be ascertained by applying test-paper to it in its melted state, and it is freely soluble in alcohol, the solution being strongly acid. It at once forms a clear solution in hot alkaline liquids, while the original fat would under similar conditions have formed a milky-looking fluid. It is, in fact, a true *acid*, capable of forming salts, the potash and soda salts being known as *soft-soap* and *hard-soap*, which have been thus generated out of the elements of the

SOAP.

neutral fat under the influence of the alkali. Stearin (q.v.), when thus treated, yields *Stearic Acid*; palmitine yields *Palmitic Acid* (q.v.); and oleine, *Oleic Acid* (q.v.); while common fat, which is a mixture of the three above-named fats, affords, on saponification with an alkali, and subsequent decomposition of the S., a mixture of the three fatty acids.

The term S. is sometimes extended in meaning, to include compounds of the fatty acids with other bases besides the alkalies, e.g., lime, baryta, magnesia, etc.; but these compounds being insoluble are inapplicable to the purpose of cleaning. The true soaps owe their cleaning power to their solubility, and their attraction for the matters that ordinarily constitute 'dirtiness.' The presence of a portion of free alkali increases the detergent power, especially in the case of greasy matter.

Manufacture.—Hard-soap is made from tallow, palm-oil, olive-oil, cotton-seed-oil, bone grease, and kitchen fat, by boiling to saturation with caustic soda. Cocoa, palm-nut, almond, sperm, and some other oils are occasionally used, chiefly in imitating superior soaps, and the only other ingredient of consequence is rosin, the residuum of the distillation of rough turpentine. In s. Europe, coarse olive-oil is the staple material, and from this are produced the marbled and white soaps known as 'Marseilles' or 'Castile.'

The S.-maker first dissolves in boiling water 6 to 8 cwt. of crude soda-ash (see SODA) in a cast-iron circular vessel (contents may be 1,000 gallons) furnished with a steam-pipe in its centre. He then adds half the weight of *pure caustic* lime, and boils the mixture. When the lime has rendered the soda caustic, the boiling is discontinued, subsidence takes place, and the lye is ready for use.

S.-pans are of various sizes. One of moderate dimensions may turn out six to eight tons, and is usually formed of four pieces of cast-iron—lower casting, about five ft. in diameter; upper, eleven. Heat is applied either by means of a furnace beneath the bottom piece, or by open steam introduced by a pipe led to a circular perforated ring at the bottom of the pan. Steam-boiling being now in general use, this description will apply to that method.

Curd or White Soap.—20 cwt. of tallow or other fat being put into the S.-pan, and a quantity of the prepared lye, steam is turned on, and boiling continued until the lye is thoroughly incorporated with the tallow and becomes a pasty mass. A measured quantity of common salt is now added, when the lye begins to separate. The partially formed S. is allowed to cool; and the salted lye, now deprived of its soda, subsides, and is drawn off from the bottom by a pipe, or removed by a pump. The operation of adding and boiling with lye is repeated until the tallow is saturated with soda and the lyes show as much alkali after boiling as before. The S. is now treated with weaker lye, and by more or less water brought to the consistency that the maker requires. From its tendency to thicken rapidly,

SOAP.

It is transferred to the frame at a higher temperature than the S. next described.

Pale or Yellow Soap.—When the tallow is saponified as above described, about $\frac{1}{3}$ of its weight of rosin is added, and the boilings with lye repeated until the mass is thoroughly saponified. The practiced workman, being aware that perfect S. is insoluble in strong alkali, avoids the risk of imperfect particles escaping the action of the lye by their being enveloped in perfect S., by reducing the mass with water, and adding lye gradually until the S. again floats as a curd on the liquid. The S. is then cooled down, and the lye being removed as completely as possible, it is boiled with the quantity of water necessary to bring it to the consistency required. These later operations require much experience, and the best theoretical knowledge requires the aid of tongue and eye to carry them through with success. The S. being now *finished* (the technical term), the copper is covered up, and the contents allowed to settle until the temperature falls to about 160° F. According to the quantity of water used, so is the deposit, called the *nigre*, greater or less. When too much water is used, the produce of S. is too small; when too little, the produce is large, but of inferior quality, from insufficient deposit of impurities. This *nigre* is employed in making second-class S. When of proper temperature, the S. is removed into frames, now usually of cast-iron, containing about 10½ cwt. each, where, after solidifying, which it does in three days, it is cut by wire into slabs, which are again cut transversely into bars for the market.

Mottled Soap is made of kitchen fat (no resin). The process described in the making of curd S. is followed, except that when perfect the S. is, when almost boiling, put into wooden frames three or four times as high as the ordinary frame of 52 inches, and the lye allowed to percolate through the soap to the lower part of the frame, producing the mottled appearance desired. As this S., when subjected to any mixing operation, lost its *mottle*, it long held high reputation as a genuine S.; but since cheap imitations, with a beautifully marbled appearance, are produced from cocoa and palm-nut oils with coloring and siliceous matter, its prestige is on the wane.

The numerous patents taken out for improvements in S.-making have had the object more of cheapening, by addition of various articles to S. in its semi-fluid state, than of improving the manufacture.

Marine Soap, or *Salt-water S.*, is made of cocoa-nut oil and soda. Cocoa-nut oil does not form an emulsion with weak alkaline solutions; but with strong solutions it saponifies readily even without heat, and forms, without any separation of the under-lye, a firm S., notwithstanding the presence of considerable water. This S. is not insoluble in a strong solution of salt, hence it can be used for washing with sea-water: hence its name.

Soft-soap differs from hard in having potash for its base instead of soda. The repeated changes of lye described in the manufacture of hard-S. are here inadmissible, for all

SOAP—SOAPBERRY.

the lye employed remains in combination with the oily materials, and is never separated. Hence open steam, as throwing in water into the mass, cannot be applied, nor can salt, so useful an agent in hard-soap manufacture, be used, as it would tend to separate the S. from the lye, while a thorough combination is essential. The making of soft-S. requires experience and nicety, it being so easy to overdo the supply of alkali, which cannot happen in hard-S. A ton of materials, consisting of 1,900 lbs. of fish or other oil, with 340 lbs. tallow, is put into the S.-pan with 200 gallons of American potash lye of such strength that 6,600 grains of real potash are in each gallon. After being boiled by the heat of a furnace, and well beaten down on the surface to keep in bounds the frothy mass, a stronger lye, containing about 8,700 grains of potash per gallon, is added at short intervals, and the boiling carried on until the workman ascertains by taste and appearance that the soap is perfect. The tallow serves to give consistency to the S., and also produces white specks of stearate of potash, which much enhance its appearance.

Toilet Soaps, for use in personal ablution, differ essentially from the kinds above described. But manufacturers of toilet soaps study to have them free from uncombined alkali, whose presence is injurious to the texture of the skin. Such soaps are also perfumed, tinted, and cast into convenient forms.

SOAP, MEDICAL USES OF. The only kind of S. that should be used internally is *White Soda S.* It is prepared from caustic soda and either olive or almond oil. In its purest state it is called *Medicinal S.*, while in its less pure forms it is known as Alicant, Venice, Spanish, or Castile soap. When properly made, it should be perfectly soluble in pure water and in alcohol. It is employed chiefly to form pills of a gently aperient and antacid action. Pills containing a combination of S. and dried carbonate of soda are of great use in certain forms of gravel. S. is often added to pills as an adjuvant, or to prevent them from becoming hard and insoluble. White S. affords a ready antidote in cases of poisoning with the strong mineral acids.—*Soft S.* ought to be made with olive-oil and potash, and it should be of yellowish-white color, inodorous, and of the consistence of thick honey. It is of great service, as an external application, either alone or in association with sulphuret of potash, and other remedies, in various cutaneous affections.

SOAP'BERRY (*Sapindus saponaria*): West Indian tree, of nat. order *Sapindaceæ*, the pulp of whose fruit is used instead of soap in washing. This property belongs to other species of the same genus. Except *S. marginatus*, found in the southern states, the genus is entirely tropical. The use of the pulp as soap, if often repeated, is apt to injure linen; but it is capable of cleansing as much linen as 60 times its weight of soap. Each fruit contains a nut of shining black color. These nuts are very hard, and were formerly imported into Europe to be made into waistcoat buttons, being tipped with silver or other metal. They

SOAP-PLANT—SOAPWORT.

were little liable to injury by wearing or to be broken. The *S. marginatus* is a small tree, with 8–20 lanceolate leaves on leaf-stalk often margined; the small white flowers in panicles produce large whitish berries.

SOAP-PLANT (*Chlorogalum pomeridianum*): Californian plant of the order *Liliaceæ*, the remarkable fibrous-coated bulb of which, stripped of its fibres, is an excellent substitute for soap, with the odor of new brown soap. The branching brownish stem, 1–3 ft. high, bears scattered bracts and flowers, with the narrow segments of the perianth marked by three colored nerves: the leaves are broadly linear, 6–18 in. long. Two other species on the Pacific coast, having probably the same detergent virtue, are *C. parviflorum* and *C. angustifolium*.

SOAP'-TEST: mode of determining the degree of hardness of water. Every one knows how much more readily a lather is formed—e.g., in washing the hands—with soft than with hard water. This is accounted for by the earthy bases (lime and magnesia) of the hard water displacing the alkaline bases of the soap, and forming, with the fatty acids, compounds insoluble in water. This is the foundation of the S.-T. A measured volume of the water is put in a bottle, and into this is dropped from a graduated vessel a standard solution of soap, till the mixture, by addition of the last drop of soap, has acquired the property of throwing up a creamy froth when shaken violently—thus showing that all the soap-destroying constituents have been precipitated. The volume of soap required is the measure of the hardness of the water. The soap solution is referred to a standard by means of water of a known degree of hardness prepared from a known weight of lime carbonate by converting it into neutral calcium chloride, dissolving this in water, and diluting to a certain volume. A water has 1, 2, 3, etc., degrees of hardness if, in soap-destroying power, it is equivalent to a solution of calcium carbonate containing 1, 2, 3, etc., grains of this salt per gallon.

SOAP'WORT (*Saponaria*): genus of plants of nat. order *Caryophyllaceæ*, having a cylindrical or ventricose 5-toothed calyx, without any outer calyx or attendant bractæ, five undivided petals with long claws, ten stamens, two stigmas, and a capsule opening at the top by four valves. Some species have very beautiful flowers: *S. Calabrica* has become one of the most favorite annuals in flower-gardens.—COMMON S. (*S. officinalis*), often called Bouncing Bet, is 1–2 ft. high, has leaves 3–5-ribbed, and pale rose or white petals, notched at the end, most commonly double-flowered. It is found on waysides, in thickets, and on the banks of streams, in most parts of Europe. Both the root and the leaves contain Saponin (q.v.), so that they are sometimes used in washing. The brownish-red color of the bark, of the root, however, is apt to tinge white articles. The root of this plant has also medicinal properties, being aperient, resolvent, and alterative; and is sometimes sold as RED SOAP-ROOT.

SOAR—SOBER.

Nearly allied to genus *Saponaria*, but having an angular calyx and a 5-valved capsule, is genus *Gypsophila*, some species of which are called SOAP-ROOT, and contain much saponin. Thus, the EGYPTIAN SOAP-ROOT (*G. struthium*), and the SPANISH SOAP-ROOT (*G. Hispanica*), called *Jabonera* in Spain, have been used in washing from time immemorial, and the roots, not having a dark rind, can be used for washing white articles, and are to some extent an article of commerce, being used for silken and other stuffs whose colors do not bear the application of soap. The roots of *Lychnis dioica*, a common Brit. plant, have the same properties in less degree.—The bark of *Quillaja saponaria*, Chilian tree of nat. order *Rosaceæ*, contains much saponin, is generally used for washing in Chili and Peru, and there forms a considerable article of commerce under the name Soap-bark.—Some tropical South Sea Islands produce a species of vine (*Vitis saponaria*), whose stem, especially the thicker part, cut into pieces, and softened by cooking on hot stones, produces in water a rich lather almost equal to that of soap. See also SOLANUM.

SOAR, v. *sōr* [F. *essorer*, to expose to the air, to mount or soar up—from L. *ex*, out; *aura*, air: It. *sorare*, to hover in the air like a hawk]: to mount up on the wing; to fly aloft; to rise high in thought or imagination: to be sublime, as the poet or orator; to be lofty generally: N. a lofty flight. SOAR'ING, imp.: ADJ. rising aloft: N. act of towering in thought or mind. SOARED, pp. *sōrd*. SOAR'INGLY, ad. *-lī*.

SOARANT, a. *sōr'ant*: word used in modern heraldry as a synonym of Volant (q.v.).

SOAVE, a. ad. *sō-ā'vā*, or SOAVEMENTE, ad. *sō-ā'vā-mēn'tā* [It.—from L. *suavis*, sweet]: in *music*, sweet; with sweetness.

SOB, v. *sōb* [an imitative word: A.S. *seofian*, to lament: Ger. *seufzen*, to sigh]: to sigh with a sudden and convulsive heaving of the breast; to weep: N. a short convulsive sigh. SOB'BING, imp.: N. act of sighing with convulsive heavings of the breast; a modification of the ordinary movements of respiration excited by mental emotions. It is the consequence of a series of short convulsive contractions of the diaphragm, and is usually accompanied by closure of the glottis, preventing entrance of air into the lungs. SOBBED, pp. *sōbd*.

SOBER, a. *sō'bēr* [F. *sobre*; It. *sobrio*; L. *sobrius*, not drunk—from L. *so*, *se*, without; *ēbrius*, drunken]: temperate; not under the influence of strong drink; possessing habits of temperance; right in mind; not visionary or heated with passion; grave; serious: V. to free from intoxication; to become sober; to bring to a right frame of mind. SO'BERING, imp. SO'BERED, pp. *-bērd*. SO'BERLY, ad. *-bēr-lī*. SO'BERNESS, n. *-nēs*, freedom from intoxication; freedom from heat and passion; temperance. SOBRIETY, n. *sō-brī'ē-tī*, the state or quality of being habitually free from the influence of strong drink; habitual freedom from heat and passion; gravity; calmness. SOBER-MINDED, a. habitually calm and temperate. SOBER-MINDED-

SOBIESKI—SOCAGE.

NESS, *n.* the state of being free from inordinate passion; calmness.—*SYN.* of 'sober, *a.*': temperate; regular; calm; serious; solemn; grave; sedate; abstinent; abstemious; moderate; steady; cool; collected; dispassionate; unimpassioned; staid; sombre.

SOBIESKI, *so-bē-ēs'kē*, JOHN: see JOHN III., King of Poland.

SOBOL, *n.* *sō'bōl*, or SOBOLES, *n.* *sōb'ō-lēz* [*L. sōbōlēs*, a sprout, 'a shoot']: in *bot.*, a creeping underground stem. SOBOLIFEROUS, *a.* -*līf'ēr-ūs* [*L. fero*, I bear]: producing young plants from the roots.

SOBRAON, *sō-brā-on'*: village on the left bank of the Sutlej, 25 m. e.n.e. of Ferozpur, near which, 1846, Feb. 10, was a most obstinate battle between the British army of 15,000 men, under Sir Hugh Gough, and a Sikh force of 30,000. The Sikhs were strongly intrenched, and made vigorous resistance; but their earthworks were captured in succession, and they were driven across the Sutlej, with a loss in killed, wounded, and drowned of 13,000. Gough immediately followed up his victory by crossing into the Punjab in pursuit of the fleeing enemy.

SOBRIQUET, *n.* *sō'brī-kā* or *sō'*- [*F. sobriquet*, a nickname: Norm. *bruchet*, the bole of the throat: the origin of *sobriquet* is seen in the Norm. phrase, *fouler sus l'bruchet*, to seize by the throat; *sobriquet* is thus properly a chuck under the chin, then a quip or cut given, an affront, hence a nickname]: a burlesque name; a nickname.

SOC, *n.* *sōk*, or SOKE, *n.* *sōk* [*AS. soc*, liberty, franchise: Ger. *sache*; Dan. *sag*, matter, case, cause]: in *OE.*, the privilege granted by the king to a subject to administer justice and execute laws and jurisdiction; the territory in which such is exercised; a certain feudal tenure, lower than military and higher than predial service. SOC'MEN, *n.*, or SOC'AGERS, or SOC'CAGERS, *n. plu.* -*āj-ērz*, tenants whose tenure is called *socage*; tenants of the crown or a lord who were freeholders: see SOCAGE.

SOCAGE, or SOCCAGE, *n.* *sōk'kāj* [*mid. L. socāgĭum*, socage (see Soc)]: tenure of lands in England, of which the characteristic feature is, that the service is fixed and determinate in quality, thereby differing both from knight-service and from villeinage. It was originally peculiar to the Anglo-Danish districts of England. When the allodial tenure (see ALLODIUM—ALLODIAL TENURE) was converted into immediate dependence on the crown, this tenure seems to have arisen out of the necessity for commendation or seeking a lord. In Domesday, socmen are often mentioned as bound 'to seek a lord,' or free to go with their land where they pleased. The socmen of Stamford are said to be free to seek a lord, being only liable to the king for the toll attached to them as inhabitants of a borough. Three kinds of S. have been enumerated as existing at a later period—free and common S., S. in ancient tenure, and S. in base tenure. The second and third kind are equivalent to tenure in ancient demesne and copyhold tenure (see DEMESNE, ANCIENT: COPYHOLD), and the first kind is what

SOCIAL.

has generally and more properly been denominated S., where the services were both certain and honorable. Besides fealty, which the socager was bound to do when required, he was obliged to attend the court baron of his lord.

By an act passed during the Commonwealth, and confirmed under Charles II., tenure by knight-service was abolished, and all lands except copyholds and church-lands held in free alms were directed to be held in free and common socage, which is now (with those exceptions) the universal tenure of real property in England and Ireland. For Scotland, see MANRED (BONDS OF).

SOCIAL, a. *sō'shāl* [F. *sociāl*—from L. *sociālis*, social— from *socius*, a companion: It. *sociale*]: pertaining to men as living in society; ready to engage in friendly and familiar intercourse; companionable; disposed to mix in society; festive. **SO'CIALLY**, ad. *-lī*. **SO'CIALNESS**, n. *-nēs*, or **SO'CIAL'ITY**, n. *-shī āl'ī-tī*, quality of being social; fellowship. **SO'CIABLE**, a. *-shā-bl*, fit to be conjoined; disposed to mix in society in friendly intercourse; inclined to familiar and easy conversation in company; friendly; companionable: N. *familiarly*, a pleasant meeting or assembly; a kind of couch for two persons; a kind of carriage. **SO'CIABLY**, ad. *-blī*. **SO'CIABLENESS**, n. *-bl-nēs*, or **SO'CIABIL'ITY**, n. *-shī-ā-bl'ī-tī*, disposition to associate in familiar intercourse. **SO'CIALIZE**, v. *-shāl-īz*, to render social; to reduce to a social condition. **SO'CIALIZING**, imp. **SO'CIALIZED**, pp. *-īzd*. **SO'CIALISM**, n. *-shāl-īzm*, that system which has for its object the reconstruction of society on the basis of a community of property, and association instead of competition in every branch of human industry—a theory held sometimes in alliance with communism (see below). **SO'CIALIST**, n. *-īst*, one who advocates the system of socialism. **SO'CIAL-IS'TIC**, a. *-īs'tīk*, relating to or like socialism. **SOCIAL EVIL**, n. a term often applied to prostitution. **SOCIAL HYMENOPTERA**, n. in *entom.*, term embracing those ants, bees, and wasps living in community. *Apis mellifica*, the hive-bee, is the best-known example. **SOCIAL PLANTS**, in *bot.*, such plants as grow naturally in groups or masses. **SOCIAL SCIENCE** (see below). **SOCIAL WAR**, name given to the war (B.C. 91) between the Romans and those of the Italian tribes who were specially termed the allies (Socii) of the Roman state, in which the latter fought for admission to the rights and privileges of Roman citizenship, which object they ultimately obtained. **SO'CIATIVE**, a. *-shī-ā-tīv*, that may associate with.—**SYN.** of 'sociable, a.': friendly; social; familiar; companionable; conversable; accessible; communicative; convivial; festive.

SOCIALISM.

SOCIALISM, *só'shal-izm*: term denoting a class of opinions opposed to the present and historical organization of society, and seeking to introduce a new distribution of property and labor, in which organized *co-operation* rather than *competition* should be the dominating principle, under the conviction that the happiness of the race, and especially of the classes without capital, would be procured or greatly advanced thereby. Historically considered, S., like many significant phenomena of the 19th c., is a product of the French Revolution, or at least a development occasioned by that crisis in opinion and action. That terrible outburst of popular discontent is most properly regarded as an attack on the whole social system rooted in the feudalism of the middle ages. The furious hatred for the court and the aristocracy, the passionate love for the 'people,' for 'humanity,' for 'liberty,' though called forth by special circumstances, and never formally worked out into a theory of social life, virtually contained the germs of all later proposed reorganizations. Naturally such a general movement to tear up ancient governmental systems by their roots assumed an anarchic form, and in fact, in its immediate action, tended to anarchy. Its first results could be only frightful and monstrous; whatever benefits it might conceivably work could emerge only in some later time when the fury of passion, like a storm, had spent itself. Then, in calmer air, men could take note of the lessons of the awful catastrophe—recognizing it as an imperative call to reconsider their established tenets, and to give place to long-forgotten fundamental facts in human nature and principles of human society.

In the middle ages, the *right* of freely and fully enjoying life, property, and political independence was limited to a favored few; while the great masses were condemned to dumb servitude and a perpetual minority. Even the industrial population did not recognize the socialistic idea. The members of the different guilds or fraternities claimed exclusive right to exercise certain branches of industry, and probably the great majority of the inhabitants of a town remained in a disregarded and dependent state. Amid such social conditions, resting, as they did, on an unchristian belief in the necessity of different ranks to be kept utterly distinct, the free action of individual life, and even the vital progress of the whole community, became nearly impossible. We have not space here to trace the course of the various minor reforms that weakened the authority of the mediæval theory of life; but we must not omit to notice the speculations of the political philosophers of the 18th c. in France, England, and Germany, as operating powerfully in favor of a new social system, in which the idea of humanity (assuming at the French Revolution, as we have observed, the concrete form of the 'people') stands out prominently. Nevertheless, the first shape that the modern spirit of industry took was not socialistic, in the proper sense of the term: it was rather individualistic, and found, as it still finds—for it is yet the prevailing theory—its natural expression in such proverbs as, 'A fair

field, and no favor;’ ‘Every one for himself, and God for us all.’ But still, even this lawless individualism is to be regarded as a protest against the false *class*-legislation of preceding times, and as an assertion of the absolute right of *each member of society* to some share in the general welfare. That a mere unbalanced individualism has not universally commended itself to civilized mankind, as a perfect system, is demonstrated by the appearance and temporary popularity of such schemes of society as those of Owen (q.v.), Fourier (q.v.), St. Simon (q.v.), and the enthusiasm excited at intervals in different parts of Europe by the promulgation of even extreme communistic opinions. See COMMUNISM: INTERNATIONAL, THE.

It is objected to S., under its various forms, that it makes human happiness too much dependent on material gratifications; that it robs man of the energy that springs from ambition; that it unphilosophically ignores an individualism and inequality to which Nature herself has given her inviolable sanction; and that, by the abolition of social rewards and punishments—removing the stimulus of emulation—it neither holds out any hope to the industrious, nor excites any apprehension among the indolent. Facts of this sort must not be left out of consideration. On the other hand, it is to be admitted that the vigorous assertion of socialistic principles has led men to a more liberal and generous view of humanity as a whole. Moreover, it has forcibly called public attention to numerous evils that have sprung up with the modern development of industry, for which no remedy—not even a name—had been provided; to the vital interdependence of all classes; and to the inadequacy of the merely individual or ‘selfish’ system, as it has been called, to redress the wrongs or cure the evils that inevitably spring from its own unchecked operation. The spread of socialistic opinions in Germany, taken in connection with the two attempts made on the life of the emperor, led 1878 to special and stringent legislation designed to check the growth of Socialism. The Socialist (Sozial-Demokrat) vote (1881) was 311,961; it was 550,000 (1884), and the Socialist deputies in the reichstag increased from 13 to 24; the vote (1887) was 774,000, but their representation was reduced to 11, owing to a coalition between the other parties and factions. In the general election of 1890 the Socialists elected 35 deputies: in the city of Berlin they polled a large majority of the votes—125,000 out of 230,000; and in nearly every industrial centre they were victorious.—An active Socialist propaganda is conducted both in England and the United States through the press and in meetings of the people and of societies. The publication of Edward Bellamy’s *Looking Backward* led to the organization of numerous *Nationalist* clubs in both the east and the west, whose object was to promote the realization of the socialistic ideas of that book. But the Nationalist ‘movement,’ though still active, and perhaps gaining favor in some of its suggested details, is probably no longer making rapid advance as a complete system.

SOCIAL SCIENCE—SOCIAL WAR.

The propaganda of S. is carried on by the publication of newspapers, essays, and tracts, by republication of such of the works of Stuart Mill, Carlyle, and other noted writers as favor S., and by circulating Marx's *Capital*, Schäffle's *Quintessence of Socialism*, Wm. Morris's *News from Nowhere*, etc.—See SOCIOLOGY: NATIONALISM: ATELIERS, NATIONAUX: BROOK FARM ASSOCIATION: BLANC, JEAN JOSEPH LOUIS: FOURIERISM: LASSALLE, FERDINAND: MARX, KARL: SAINT-SIMON, CLAUDE HENRI: OWEN, ROBERT: PERFECTIONISTS: ETC.: also COMMUNISM.

SO'CIAL SCIENCE: science relating to the social improvement of the community; a department under the more extended term Sociology (q.v.). A society called 'The National Assoc. for the Promotion of Social Science' was organized in London, at a meeting under Lord Brougham's auspices, 1857, July, to consider the best means of uniting all those interested in social improvement. The annual meetings have been held each year at a different place. The assoc. as now constituted comprises five sections—1. Jurisprudence and Amendment of the Law (subsection, Repression of Crime); 2. Education; 3. Health; 4. Economy and Trade; 5. Art. The 'American Social Science Assoc.' was founded 1865, and holds annual meetings in different cities. Its objects are the same as those of the English National Association.

SOCIOLOGY is the science of the origin, organization, and development of human society.

SO'CIAL WAR, in Roman History: the war of the Roman people with their allies among the states of central and s. Italy, who, having been allies (*Socii*, hence *bellum sociale*, 'war with the allies') of Rome, rose in revolt B.C. 91, and proposed the formation of a new Italian state. The leaders in the revolt were the Marsi (hence the S. W. was called also the Marsian war), the Peligni, the Samnites, the Lucanians, and the Sabellians. The S. W. lasted 3 years; and only by wise and liberal concessions to the Latin states was their confederacy weakened, and the authority of Rome reasserted. By the *lex Julia* (B.C. 90), the Roman franchise was offered to such of the *Socii* as had not revolted; by the *lex Plautia Papiria* (B.C. 89), any citizen of an allied state in revolt could obtain the franchise by giving his name to a pretor in Rome within 60 days; by the *lex Calpurnia*, Roman magistrate, in the field were empowered to bestow the franchise on all who were willing to receive it. By these measures of concession and redress of grievances, the Italian confederation was by the end of A.D. 89 reduced to two peoples—the Samnites and the Lucanians—and their strength was broken by Sulla's brilliant campaign in Samnium.

SOCIETIES—SOCIETY ISLANDS.

SOCIETIES: associations of individuals for promotion of some particular object. Such objects are numerous, including the promotion and investigation of almost every well-recognized branch of science, art, and literature; the diffusion of knowledge, religion, and morality; intercourse between those of the same profession or trade; removal of legal grievances; mutual aid in case of distress; and other aims beneficial to the general public or to the members of the society alone. Those S. whose objects are scientific or literary are occasionally called *Academies* (q.v.), and under this or their own special names are notices of the chief societies at present existing.

SOCIETY, n. *sō-sī'ě-tī* [F. *société*—from L. *societas* or *societatem*, society—from *socius*, a partner, a companion]: a number of persons associated for a particular purpose (see **SOCIETIES: ETC.**: also **ACADEMY**): fellowship: the civilized body of mankind; the public: those persons in any community who usually associate together: a religious body, as a missionary *society*: the class whose members whether titled or untitled take the highest social position; in *OE.*, company; converse.

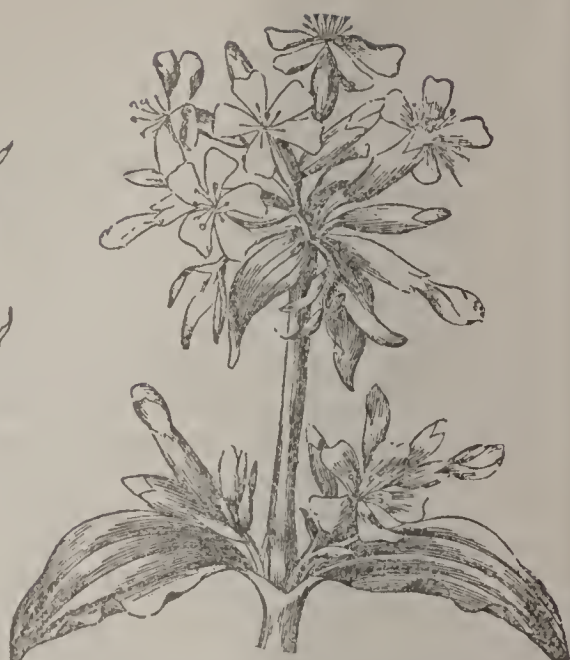
SOCIETY ISLANDS: small archipelago in the s. Pacific Ocean; lat. 16°—18° s., long. 148°—155° w.; comprising islands all now French possessions. There are 13 main islands—Tahiti (q.v.) or Otaheite, Maitia, Eimeo, Maiaoiti, Tetuaroa, Otaha, Moorea, Tuba, Lord Howe's Island, Scilly Island, Huahine, Raiatea, and Borabora: 1,411 sq. m. The cap. of Tahiti is Papiete (pop. 4,300). The chief agricultural enterprise in Tahiti is an estate of 10,000 acres in the hands of an English company. The islands closely resemble each other in appearance. They are mountainous in the interior—some summits rising 6,000 to 8,000 ft.; with tracts of low-lying and extraordinarily fertile land occupying the shores all round from the base of the mountains to the sea. They are surrounded by coral reefs, are abundantly watered by streams, and have a temperate and agreeable climate. Almost every tropical vegetable and fruit known is grown here; but agriculture is backward. The animals are those usually found in the South Sea Islands. The inhabitants belong to the Malay race; are affable, ingenious, and hospitable, but volatile and sensual. The practice of tattooing has almost disappeared, and the native costume now closely resembles that of civilized nations. There are now no native manufactures, these having been entirely superseded by imported goods. Cocoa-nut oil, oranges, lime-juice, arrow-root, kauri shells and pearl shells are the principal exports; and cocoa-nuts are the general article of barter throughout the islands for calicoes, cotton cloth, knives, cordage, groceries, etc., imported chiefly from Tahiti. In 1901 the imports amounted to about \$879,318.04; the exports to \$736,174.78.

Tahiti is said to have been visited as early as 1606 by Quiros. Captain Cook reached it 1769, and discovered many of the other islands of the archipelago, to which he gave the name S. I., in honor of the Royal Soc. of

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London. In 1797 the first mission-ship fitted out by the newly formed London Missionary Soc. arrived at Tahiti. After 19 years of apparently fruitless labor, the influence of the missionaries began to be felt, and soon afterward became so powerful as to be almost paramount. A quarrel between the Prot. and the Rom. Cath. missionaries who thought it better to enter on ground already occupied by Protestants, than to take up new ground for themselves, occasioned interference by France in favor of the Rom. Catholics, and the island of Tahiti was taken possession of in the name of Louise Philippe, by a strong French force, 1844. All the possessions of the native ruler were afterward placed under the protection of France; and by a treaty concluded 1880, Tahiti and its dependencies (particularly Moorea, Tetuaroa, and Raiatea) became French possessions. Many of the Prot. missionaries left the island in consequence of the interference of the French authorities with their labors. Some, however, remained, and the congregations continued to meet. An application to the Brit. govt. procured a concession on the part of the French govt. of some of the rights of religious liberty, which had been taken away by the local authorities.—King Pomare V. died 1891, June 15; and, according to the treaty, royalty then ceased to exist, and the annexation to France was complete.—Pop. (1884) 25,050.

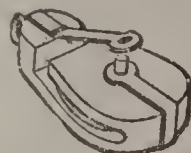
SOCINIAN, *n.* *sō-sīn'ī-ăn* [from Lælius and Faustus *Socīnus*, founders of the sect in the 16th c.]: follower of Lælius and Faustus Socinus, who taught that Jesus Christ was a mere man, and who denied the Trinity, the personality of Satan, the native and total depravity of man, the atonement, and the eternity of future punishment: *ADJ.* pertaining to Lælius and Faustus Socinus or their doctrines. SOCIN'IANISM, *n.* *-izm*, doctrines of Socinus.



Water Soldier (*Stratiotes aloides*). Soapwort (*Saponaria officinalis*).



Soosoo (*Platanista Gangetica*).



Snatch-block.



Snow-shoe.



Common Snowdrop (*Galanthus nivalis*).

SOCINUS.

SOCINUS, *sō-sī'nŭs*, FAUSTUS (It. FAUSTO PAOLO SOZINI, *fows'to pā'o-lo sōt-sē'nē*, so spelled by himself): Unitarian theologian: 1539, Dec. 5—1604, Mar. 4; b. Siena, Tuscany; nephew of Lælius S. (q.v.). By the mother's side, he was very highly connected; but having lost his parents while young, his education was carelessly conducted; and he himself lamented the imperfection of his scholastic culture. His lack of learning, however, only induced him to speculate more freely; thus it happened, partly from native bias, partly from the influence of his gifted uncle, that S. was an anti-Trinitarian before he was 22 years old. In 1559, when only 20 years of age, being charged with Lutheranism, he found it advisable to seek asylum in France, and was living at Lyon when he heard of his uncle's death. He immediately went to Zürich, and possessed himself of his uncle's MSS., after which he returned to Italy, and 1563 again conformed to the Rom. Cath. Church, and entered the service of Isabella de' Medici. Amid the cares of office and the dissipations of a court, he seemed to forget the thorny questions of theology. But at the end of 12 years he was seized with desire to investigate the truths of religion; and in spite of all remonstrances from Rom. Cath. friends, proceeded to Germany—the centre of theological activity. In 1574 he retired to Basel, to prosecute his studies more closely; but a disputation which he had with a certain Fr. Pucci (1578) made it necessary for him to leave Switzerland. At the request of George Biandrata, he visited Transylvania, where anti-Trinitarians were numerous, especially among the nobles—the bishop Francis Dávid tending to the denial of any (even though only nominal) divine honor to Christ. S.'s scheme permitted seeming acceptance of the doctrine of the church by using the terms of the creed in a new and rational sense: Christ was even to be addressed as God, with the understanding that he was a subordinate God into whose hands the only Supreme God had given for a time the government of this world. S. spent months in Dávid's house, eloquently urging this view. The effect on the bishop, who seems to have been a man pure in motive, positive in conviction, and straightforward in utterance, was to call forth his public refusal of any form of worship or invocation of Christ as God; of which innovation his political enemies took advantage, and he died in prison. S. (1579) went to Poland before Bp. Dávid's trial; and there eagerly sought (not without success) to make converts to his peculiar views. Anti-Trinitarianism was even stronger in Poland than in Transylvania, and there he preached and disputed and wrote with a zeal that Socinianism has seldom displayed since. His influence ultimately became controlling in that country. His position in relation to the Reformers was, that Luther and Calvin had rendered great services to religion, but that they had not gone far enough; that the only solid basis on which Protestantism could rest was human 'reason;' that everything that contradicted reason should be rejected as false and incredible; and that dogmas that were absurd

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should not be allowed to shelter themselves from criticism because their defenders chose to call them 'mysteries.' The Protestants in Poland were alarmed, and their leaders undertook publicly to confute S. A disputation in the college of Posna ended in S. reducing his opponents to silence, but they retaliated (after the fashion of the times) by raising against him a charge of sedition, which, though groundless, made it necessary for S. to withdraw from Cracow. While in retirement on the estate of a Polish noble, Christopher Morsztyn, he married the daughter of his protector: she seems to have been a tender and affectionate wife; and her death 1587 almost broke his heart. About this period, his property in Italy was confiscated by the Inquisition, but his powerful and wealthy friends in Poland were generous to him in his needs. In 1588 he took part in the synod of Brest (on the borders of Lithuania), and combated all the principal dogmas of the church—the divinity of Christ (as also the Arian theory of Christ's pre-existence), propitiatory sacrifice, original sin, human depravity, and justification by faith. In 1598, on the publication of his *De Jesu Christo Servatore*, his enemies stirred up the populace of Cracow against him; and S. was pulled from a sick-bed, and nearly murdered. Soon afterward he found refuge with a friend in the village of Luclavie, where he died.—S.'s works are no longer read; but his opinions have never lacked advocates in any Prot. country. He and his uncle were precursors of that spirit of rationalism which has so widely manifested itself in modern thought.—See Przipcow's *Life of S.*, prefixed to a collection of his works in *Bib. Frat. Polonorum* (Amst. 1656): this, which presents one view of S., is the foundation of Bayle's article in *Dictionnaire*, and Toulmin's *Memoirs of the Life, Character, etc., of F. S.* (Lond. 1777): but see his letters, published and unpublished, which freely reveal his character. His theological system is best traced in the *Racovian Catechism* (q.v.).

SOCI'NUS, LÆLIUS (It. LELIO FRANCESCO MARIA SOZINI, *lā' lī-o frān-chēs' ko mā-rē' ā sō-tsē'nē*: the elder of two celebrated theological controvertists—uncle and nephew—who have given name to a sect of Christians, the Socinians, one of the various divisions of Unitarians (q.v.): 1525, Jan. 29—1562, May 14; b. Siena, Tuscany; of a family distinguished in literature and science. After some legal training, he turned to theological investigation, ultimately resulting in his dissent from the standard dogma of the church as to the basis of salvation, as to predestination, as to the resurrection, and as to the sacraments, with serious questioning of the doctrine of the Trinity. He travelled in France, England, Holland, Germany, and Poland, making the acquaintance of many scholars, and finally settled in Zürich, where he died. S. seems to have had great genuineness of character, and a charming spirit. He was prudent and reticent in speech; but in his correspondence with his Italian relatives and friends, he showed himself an ardent and able disputant, and made not a few proselytes. His intellectual tendencies were toward mysticism

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and theological subtlety, his religious feeling was spiritually deep and enthusiastic. Calvin and Melanchthon were his friends—the former criticising his over-speculative tendency, but commending him by letter when he visited the courts of Vienna and Cracow; and Melanchthon giving him similar introduction to Maximilian II. 1558. S. sought rather for spiritual truth than to be the founder of a sect, though doubtless he greatly influenced the thinking of his nephew, Faustus.—See Illgen's *Vita Lælii Socini* (Leip. 1814), and *Symbolæ ad Vitam et Doctrinam Lælii Socini* (Leip. 1826); also Trechsel's work.

SOCIOLOGY, n. *sō'shĭ-ō'ō-jĭ* [L. *socius*, a companion, an associate; Gr. *logos*, discourse]: science which treats of man in his social capacity, including politics, political economy, and such subjects; social science. **So'CIOLOG'ICAL**, a. *-ō-lĭj'ĭ-kāl*, connected with or related to sociology.—*Sociology* investigates the origin and transformations of human society, the sources of political authority, of laws and customs, of property. Hence it has to do with the grouping of men in hordes, tribes, nations, etc., to develop the primordial impulses to aggregation in society, the primitive forms of society, the nature of the principle of union in the earliest human aggregations (motherhood or 'mother-right,' fatherhood or the authority of the father, *patria potestas*); and the causes which give rise to large human aggregation, as when hordes are united in a tribe or tribes in a nation. In existing nations, Sociology studies the interaction of the several elements that make them up, of the several activities—political, industrial, scientific, moral, criminal, etc.—that constitute the sum of their life, hence one very large department of the science is Statistics: such documents as the reports of the census bureau are the *data* of S. How Law has its source in Custom, S. shows by archeological research and by the study of existing primitive communities. The question of the origin of Property as an institution falls within the domain of S., and there it is studied according to the historical method, by which (e.g.) it appears that the idea of personal (or individual) property in goods or chattels, and in land, arises only in a society comparatively developed; while in primitive societies land is communal, as also are goods and chattels.—See **SOCIAL SCIENCE**: also **GOVERNMENT**: **COMMUNISM**: **SOCIALISM**: **RELIGION**: and many references from these.

SOCK, n. *sōk* [F. *soc*; Gael. *soc*, a plowshare]: in *Scot.*, the share of the plow.

SOCK, n. *sōk* [F. *socque*, a sock—from L. *soccus*, a kind of shoe worn by comic actors: Icel. *sockr*; It. *socco*; Sp. *zoco*, a wooden shoe]: a covering for the feet; a kind of half-stocking; the shoe of the anc. comic actors—hence, comedy. **SOCK'LESS**, a. *-lē's*, without a sock.

SOCK, v. *sōk* [Gael. *soc*, a beak, a snout]: in *slang*, to knock a man's hat over his eyes and nose by a smart blow. **SOCK'ING**, imp. **SOCKED**, pp. *sōkt*.

SOCK—SOCOTRINE.

SOCK, n. *sők* [Ger. *saugen*, to suck: Gael. *sògh*, a dainty, a luxury]: in *OE.* and *slang*, a feast; a treat; a dainty.

SOCKET, n. *sők'èt* [dim. of *Sock* 2, the original sense being evidently 'a small wooden shoe': .. *zocco*; F. *souche*, a stock or stump of a tree: F. *souchet*, a little stock or stump; *socle*, the base of a pedestal: It. *zoccolo*, a plinth, a wooden shoe]: the hollow base upon which a candle is fixed, like a tree upon its stump; any small hollow to receive and hold something; the receptacle of the eye. **SOCLE**, n. *sō'kl* or *sők'l*, in *arch.*, a plain, square, flat member used instead of a pedestal to support a column, a statue, etc.; a plinth or plain face at the foot of a wall. **SOCKET-CHISEL**, a strong chisel used by carpenters in mortising. **BALL AND SOCKET**, a socket with a knob or ball moving in it, forming a joint, which moves freely in any direction.

SOCLE: see under **SOCKET**.

SOCORRO, *sō-kör'rō*: city, cap. of Socorro co., N. Mex.; on the Rio Grande river and on the Atchison Topeka and Santa Fé railroad; 5,000 ft. above sea-level. It was at this place that Cortes met his caravan on its way from old Mexico, with supplies and ammunition, when he and his army had been driven out of Santa Fé by the Indians, and were suffering for food and ammunition. The opportune relief led him to name the place Camp Succor. Franciscan fathers followed Cortes, established missions here and in the vicinity, and founded the cathedral of San Miguel, in which services are still held. Silver was discovered by the early Spaniards, who forced the Indians to mine for them and shipped the bullion to Spain, till the Indians revolted, massacred the Spaniards, and concealed the mines. The rediscovery of these old mines, and the working of them by experienced miners and modern machinery, have greatly enriched the town and territory. S. has an incorporated bank, several churches and public schools, and 1 weekly newspaper. Pop. (1880) 1,272; (1890) 2,295; (1900) 1,512.

SOCOTRA, *sō-kō'trā*, or **SOCOTORA**, *sők'ō-tō-rā*: island near the entrance to the Gulf of Aden, 71 m. long and at its widest part 22 m. broad. The interior is mountainous, but a plain 2 to 4 m. wide skirts the greater part of the coast. The scenery of the island is impressive; there are many fertile valleys, but the soil is little cultivated, the inhabitants living mostly on their flocks of sheep and goats and the natural products of the soil. The aloes of S. is esteemed the best in the world. The island was formally annexed to the Brit. empire 1886. The inhabitants of the upland are a peculiar race, well built, with good features; those of the coast region are of mixed African, Arab, and other blood.—Pop. about 10,000.

SOCOTRINE, n. *sō'kō-trīn*: a native or inhabitant of *Socotra*, an island on the e. coast of Africa: **ADJ.** of or from *Socotra*.

SOCRATES.

SOCRATES, *sōk'ra-tāz*: celebrated Greek philosopher: about B.C. 470—B.C. 399; b. Athens. His father, Sophroniskos, was a sculptor; and S. followed the same profession in his early life. His mother, Phænarete, was a midwife, to which avocation he was wont to compare his own peculiar method of conversational teaching. His family was respectable in descent, but humble in possessions. His physical constitution was robust to an extraordinary degree, enabling him to endure the hardest military service, and to live his own chosen life of superiority to all wants above the barest necessities of life. While his ordinary diet was simple and abstemious, he could, on religious festivals or social occasions, drink more wine than any one else without being intoxicated. He had the usual education of an Athenian citizen, which included not only a knowledge of the mother-tongue and readings in the Greek poets, but also the elements of arithmetic, geometry, and astronomy as then known. As a young man, he frequented the society of the physical philosopher Archelaus (disciple of Anaxagoras); but the philosophers that did most to determine his own special turn of mind must have been Parmenides and 'the double-tongued and all-objecting Zeno.'

Except in connection with his philosophical career, few facts of his life are known. He served as a hoplite, or heavy-armed foot-soldier, at the siege of Potidæa, at the battle of Delium, and at Amphipolis; and his bravery and endurance were greatly extolled. On two memorable occasions, he stood forward in political life. After the battle of Arginusæ, 406, the ten generals in command were publicly arraigned for neglecting to obtain the bodies of the killed to receive the rites of interment. The clamor for their condemnation was so great that the court wished to proceed in violation of the legal forms; but S., as presiding judge, firmly refused to put the question. The other occasion was during the tyranny of the Thirty, who took up the policy of compelling a number of influential citizens to take part in their illegal murders and confiscations; but S. withstood them at the peril of his own life.—S. was notable for his sincere and deep piety: it is recorded that he did nothing without taking counsel of the gods. He was regular in prayer; but, as only the gods could know what was best for man, he besought them not for particular good things, but for that which was 'the best.'

About the middle period of his life, he relinquished his profession as a statuary, and began the career that made him famous. Deservedly styled a philosopher, he neither secluded himself for study, nor opened a school for regular instruction of pupils. He disclaimed the appellation of teacher; his practice was to talk or converse, 'to prattle without end,' as his enemies said. 'Early in the morning, he frequented the public walks, the gymnasium for bodily training, and the schools where youths were receiving instruction; he was to be seen in the market-place at the hour when it was most crowded, among the booths and

tables where goods were exposed for sale. His whole day was usually spent in this public manner. He talked with any one, young or old, rich or poor, that sought to address him, and in the hearing of all who chose to stand by. He visited all persons of interest in the city, male or female; his friendship with Aspasia is well known; and one of the most interesting chapters of Xenophon's *Memorabilia* recounts his visit to and dialogue with Theodotê—a beautiful *hetæra*, or female companion. Nothing could be more public, perpetual, and indiscriminate as to persons than his conversation; and as it was engaging, curious, and instructive, certain persons made it their habit to attend him in public as companions and listeners. These men, a fluctuating body, were commonly known as his disciples or scholars, though neither he nor his personal friends ever employed the terms *teacher* and *disciple* to describe the relation between them.—Grote's *Greece*, chap. lxviii.—As to his married life, see XANTHIPPE.

Another peculiarity of S. was his persuasion of a special religious mission. He had been accustomed all his life to hear what he considered a divine voice, or preternatural sign, which came to him solely as a prohibition or warning, never as an instigation to act. In deference to it, he had kept back from entering public life; and it caused him to refrain from premeditating the defense that he made on his trial. Nor was this all; relying, like his countrymen, on divine intimations by dreams and oracles, he believed that his mission had been signified to him by these. One oracular intimation in particular he described in his defense as the turning-point of his life. An admirer and friend of his, Chærephon, about the time when S. began to have some repute as a wise man, consulted the oracle at Delphi as to whether any man was wiser than Socrates. The priestess replied: 'None.' The answer, S. said, perplexed him very much; for he was conscious of no wisdom on any subject, great or small. At length, he resolved to put the matter to the test by taking measure of the wisdom of other persons as compared with his own. Selecting a leading politician, accounted wise by himself and by others, he put a series of questions to him, and found his supposed wisdom no wisdom at all. He next tried to demonstrate to the politician himself how much he was deficient; but found him impracticable on this head, refusing to be convinced. He then saw a meaning in the oracle, to the effect that his superiority to others lay not in his wisdom, but in his being fully conscious of his ignorance. He tried the same experiment on other politicians and rhetors, then on poets, lastly on artists and artisans, and with the same result. Thereupon he considered it a duty imposed on him by the Delphian god to cross-question men of all degrees as to their knowledge, to make them conscious of their ignorance, and thereby put them in the way of becoming wise. We shall see presently wherein this low view of the human intelligence differed from the contemptuous tone of a mere satirist.

The intellectual characteristics of S., through which he

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has influenced the whole subsequent course of human thought, may be stated under three heads: 1. Subject, 2. Method, and 3. Doctrine.

1. As to Subject.—Here he effected a signal revolution, metaphorically expressed by the saying of Cicero that ‘Socrates brought down philosophy from the heavens to the earth.’ The previous philosophies consisted of vast and vague speculations on nature as a whole, blending together Cosmogony, Astronomy, Geometry, Physics, Metaphysics, etc. S. had studied these systems, and they left on his mind a feeling of emptiness and unsuitability for any human purpose. It seemed to him that men’s endeavors after knowledge would better be directed to the human relationships, as involving men’s practical concerns. He could not go to any public assemblage without hearing questions agitated respecting the just and unjust, the honorable and base, the expedient and hurtful; moreover, he found that the opposing disputants were, without knowing it, very confused in their ideas as to the meanings of those large words in which the weightiest interests centred. Accordingly, he was the first to proclaim that ‘the proper study of mankind is man;’ human nature, human duties, and human happiness made up a field of really urgent and profitable inquiry. In astronomy, he saw a certain utility for navigation and for the reckoning of time, to which extent he would have it known by pilots and watchmen; geometry was useful in its literal sense of land-measuring; arithmetic he allowed in like manner so far as practically useful; but general physics, or the speculations of philosophers, from Thales downward, as to the origin of all things out of water, fire, air, etc., he wholly repudiated. ‘Do these inquirers,’ he asked, ‘think that they already know *human* affairs well enough, that they thus begin to meddle with divine? Do they think that they shall be able to excite or calm the winds at pleasure, or have they no other view than to gratify an idle curiosity?’ He considered it not only unprofitable but impious to attempt to comprehend that department. The gods, he thought, managed all those things after their own fashion, and refused to submit them to inviolable laws of sequence, such as men might discover by dint of study; the only means of knowledge permitted was religious sacrifice and prayer, and the consultation of the oracles. While this was the appointed way in reference to divine things, it was equally appointed that human things should be learned by diligence in study and investigation. The prevailing polytheism he sought to cleanse from its impurity and to raise from its imbecility; not denying the gods, but declaring it incredible that they should, as the legends and poets declared, have committed acts disgraceful in the worst of men. He held a strong conviction of the existence of a wise and beneficent Supreme Being, the creator of the universe; of whose nature he held that man, as His offspring, partook. Thence he maintained, as the proper inference by faith, the doctrine

of man's immortality, though not claiming this as an article of his knowledge.

2. In regard to Method, S. was author of still greater innovations. It was to little purpose that men applied themselves to human affairs if they conceived them loosely, with no regard to evidence. S. introduced at least one fundamental element of logical precision into the handling of questions, by insisting on accuracy in Definition and Classification. His mode will be seen in the statement of Xenophon: 'Socrates continued incessantly discussing human affairs, investigating—What is piety? What is impiety? What is the honorable and the base? What is the just and the unjust? Men that knew these matters, he accounted good and honorable; men that were ignorant of them, he assimilated to slaves.'

His investigation thus took the form of ascertaining the exact meaning—that is, the definition—of the leading terms in ethics and in politics, the settling of what J. Stuart Mill calls the *connotation* of a general word, which determines how to apply it rightly to each individual case. The very idea of defining a general term, now so obvious, never seems to have suggested itself to any one previous to Socrates. Also his manner of seeking out those definitions is characteristic, and links itself to his conversational method and his convicting men in general of ignorance in things that they thought they knew. Professing himself able to furnish no exact definition (this professed ignorance was called the Socratic irony) of justice, temperance, courage, etc., and finding every one else quite confident in their ability to supply the want, he asked some one to state his definition; and on its being given, he put a few further interrogations (as he said) by way of making sure that he understood the meaning, but with the speedy effect of driving the respondent into a humiliating self-contradiction. His method is most fully exemplified in certain of the Platonic dialogues, as the first *Alcibiadés*, *Lachés*, *Charmidés*, *Euthyphron*, etc. According to Xenophon, he could pass from his severe cross-examining method, with its humiliating shock of convicted ignorance, and address to his hearers plain and homely precepts, inculcating self-control, temperance, piety, duty to parents, brotherly love, fidelity in friendship, diligence, etc.—such direct admonitory influence being common to him with the so-called Sophists. He probably went beyond the ordinary teaching of the Sophists in exhorting men 'to limit their external wants, to be sparing in indulgence, and to cultivate, even in preference to honors and advancement, the pleasures arising from a performance of duty, as well as from self-examination and the consciousness of internal improvement.' This strain of exhortation, his manner of life in harmony therewith, and the virtual self-immolation of his death, may be considered as the conjoint root of the Cynic and the Stoic philosophies.

3. As regards Doctrine, S. was distinguished—after his tenet of one God supreme above all gods, and the Father of men—chiefly by his theory of virtue. Virtue, he said,

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consisted in knowledge. To do right was the only road to happiness; and as every man sought to be happy, vice could arise only from ignorance or mistake as to the means: hence the proper corrective was an enlarged teaching of the consequences of actions.

We cannot, on any fair interpretation of knowledge, regard this as other than a one-sided view. It takes note of one condition of virtue, since there can be no right conduct without understanding the tendency of actions, or, at all events, the meaning of rules; but it omits, what is also essential, the state of the emotions or dispositions, which may be directed either to exclusively self-regarding ends, or to ends involving also the good of others. There is an obvious connection between the doctrine and the Socratic analogy of virtue to the professions. The virtue of an artisan is contained almost exclusively in his skill or knowledge; his dispositions can usually, though not always, be depended on through the pressure of his immediate self-interest. But the practice of S. was larger than his theory; for, as already remarked, his exhortations were addressed to men's feelings or sentiments as well as to their intellect. His political doctrines were biased by the same analogy of special professions. The legitimate king or governor was he alone that knew how to govern well.

It was not under the government of the Thirty Tyrants, but under the reconstituted democracy, that S. was put to death. B.C. 399 an indictment was laid against him, in the following terms: 'Socrates is guilty of crime: first, for not worshipping the gods whom the city worships, and for introducing new divinities of his own; next, for corrupting the youth. The penalty due is death.' The trial took place before a dikastery, or law-court, composed of citizen-judges, like our juries, but far more numerous; the number present seems to have been 557. His defense is preserved by Plato, under the title *Apology of Socrates*. The tone of it, so admirable to us, was such as to make acquittal almost impossible, from the number of enemies created by his cross-questioning annoyance of all classes of men, and from various other causes. He dwelt on his mission to convict men of ignorance for their ultimate benefit; pronounced himself a public blessing to the Athenians; declared that, if his life was preserved, he would continue in the same course; and regarded the prospect of death with utter indifference. By a vote, according to the most probable account, of about 280 to 220, the charges were declared proven. A vote had then to be taken on the sentence. By the Athenian practice, the accuser named a penalty, and the accused was asked to do the same; the judges were restricted to one or other of these. The accuser named death. S., maintaining the same high tone, declared at first that he deserved the highest public reward; but, on the instigation of his friends, he ended by proposing a trifling fine. The court, by a majority, decided for the capital sentence. There was an accidental interval of 30 days before the execution, during which S. in prison conversed with his friends as usual; on the last day occurred

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his conversation on the Immortality of the Soul, referred to in the Platonic dialogue called *Phædon*. He then drank the hemlock, and passed away with the dignity and calmness becoming his past life.

‘There can be no doubt,’ says Mr. Grote, ‘that the individual influence of Socrates permanently enlarged the horizon, improved the method, and multiplied the ascendant minds of the Grecian speculative world, in a manner never since paralleled. Subsequent philosophers may have had a more elaborate doctrine, and a larger number of disciples who imbibed their ideas; but none of them applied the same stimulating method with the same efficacy; none of them struck out of other minds that fire which sets light to original thought.’—See Grote’s *Greece*; Zeller’s *Philos. der Griechen*.

SOCRATIC, a. *sō-krăt'ik*, or **SOCRAT'ICAL**, a. *-ĭ-kăł*: pertaining to the philosophy of *Socrates*, or to his method of teaching. **SOCRAT'ICALLY**, ad. *-lĭ*. **SOCRATIST**, n. *sōk'-răt-tĭst*, a disciple of Socrates, a celebrated anc. Greek philosopher. **SOC'RATISM**, n. *-tĭzm*, the philosophy of Socrates.

SOD, n. *sōd* [Low Ger. *sode*; Dut. *zode*; Fris. *satha*, a turf; Gael. *sod*, turf]: turf; sward; a piece of turf. **SOD'-DED**, a. covered with sod. **SOD'DY**, a. *-dĭ*, turfy.

SOD, v. *sōd*: did seethe, pt. of **SEETHE**, which see.

SODA, n. *sōdă* [Ger., It. *soda*; F. *soude*; OF. *souldz*, glasswort—from L. *solidus*, firm]: substance obtained from the ashes of certain sea-plants, or from sea-salt; familiar name for *carbonate of soda* (sodium carbonate or sodic carbonate). **SO'DALITE**, n. *-lĭt* [Eng. *soda*, and Gr. *lithos*, a stone]: mineral consisting chiefly of silicate of alumina and soda, found of a white, gray, yellowish, greenish, or blue color, and of a vitreous lustre. **SODIC**, a. *sō'dĭk*, combined with sodium; of or pertaining to sodium. **SO'DIUM**, n. *-dĭ-ŭm*, an elementary body forming the metallic base of soda, soft, of a silvery lustre, and lighter than water. **SODA-WATER**, a water supposed to contain a little soda, and highly charged with carbonic acid (see **AĖRATED WATERS**). **CAUSTIC SODA**, the hydrated oxide of sodium. **CARBONATE OF SODIUM**, a salt compounded of carbonic acid and sodium. **BICARBONATE OF SODIUM** (sodic bicarbonate), only slightly alkaline, and not caustic, used in the preparation of effervescing drinks and medicinal soda-water. **SULPHATE OF SODIUM**, Glauber's-salts. **SULPHITE OF SODIUM**, important for its sulphurous acid. **SODIC NITRATE**, a substance occurring in deposits of great extent in Peru and Brazil, etc., employed in the manufacture of vitriol and of artificial manure.—See **SODIUM**: **SODA**, **MANUFACTURE OF**. *Note*.—Popularly all the salts of sodium (sulphates, chlorates, etc., sulphides, chlorides, etc., sulphites, chlorites, etc.) are called sulphates. sulphides, sulphites, etc., of *soda*. The chemical nomenclature is sodium sulphate, etc.; or sodic sulphate, etc.; or sulphate, etc., of sodium.

SODA

SODA, MANUFACTURE OF: one of the chief chemical industries. Soda (correctly, sodium carbonate, or sodic carbonate, or carbonate of sodium) is important in many great chemical industries, e.g., glass-making, soap-making, bleaching, etc.

A native carbonate of sodium, or rather a sesquicarbonate, called Natron (q.v.), is found in Egypt and some other parts of the world. Enormous deposits of native carbonate of sodium, mixed in some cases with sulphate and chloride, are in Wyoming, Nevada, and California. In Hungary are several manufactories for purification of a native soda found there. Formerly, most of the soda in use was extracted from certain plants; and two kinds were known in commerce under the names Barilla (q.v.) and Kelp (q.v.).

But the quantity of soda got from all other sources is insignificant in comparison with that manufactured from common salt (chloride of sodium—see SODIUM). The process still most largely used was invented by a Frenchman, Leblanc, and was made known to the world by a commission of the French republic 1794, though dating several years earlier. It is unquestionably the most valuable discovery in the entire range of chemical manufactures; and it held the field against all competitors, and without any essential change of method, till about 1862, when the ammonia process was introduced. It is sad to think that the author of this invention reaped no benefit from it himself, but spent his last days in a hospital, ‘a wreck in fortune, health, and hope.’

The object of the soda-process is to separate the sodium of the salt, and unite it with oxygen to form caustic soda, or, what is more generally done, to unite the sodium with carbonic acid to form carbonate. The several stages of the process are as follows:

First Operation—Production of Sulphate of Soda.—The decomposition of the common salt is effected by treating it with sulphuric acid, which transforms it into sulphate of soda and hydrochloric acid. First, acid sulphate of soda is produced: $2\text{NaCl} + \text{H}_2\text{SO}_4 = \text{HCl} + \text{NaHSO}_4 + \text{NaCl}$; but then, at a sufficiently high temperature, the acid sulphate (NaHSO_4) decomposes the remainder of the common salt (NaCl) thus: $\text{NaHSO}_4 + \text{NaCl} = \text{NaSO}_4 + \text{HCl}$; hence all the chlorine is expelled as hydrochloric acid (HCl), and normal sulphate of soda (Na_2SO_4) is produced.

At first this operation was performed in a common Reverberatory Furnace (q.v.), and the hydrochloric acid was discharged into the atmosphere, thus being lost, and destroying all vegetation in the vicinity. But means were contrived for collecting the acid, which is a source of large profit. The furnaces have flat soles of cast-iron, attached to one end of which is a pan, also of cast-iron. In one form of these furnaces—the ‘open roaster’—the pan and the calcining sole are separated, so that the comparatively pure and undiluted fumes from the pan can be led away and collected by themselves. In another form of furnace

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—the 'blind roaster'—the half-finished sulphate is calcined in a muffle, so that none of the hydrochloric acid is mixed with air and fire-gases.

An important innovation was effected (1870) by Hargreaves's process for making sulphate with the aid of sulphurous acid obtained from ignition of pyrites, aided by steam and air. The reaction in the Hargreaves process is: $2\text{NaCl} + \text{SO}_2 + \text{H}_2\text{O} + \text{O} = \text{Na}_2\text{SO}_4 + 2\text{HCl}$. The common salt is rendered porous by first moistening with water and then drying again by passing through a hot-air channel on an endless chain of plates. The salt so prepared is distributed in a range of not less than eight cast-iron cylinders, which are pervaded successively by a current of mixed superheated steam and sulphurous acid given off by the pyrites.

However produced, the hydrochloric acid has to be condensed. The acid-flues convey it to the condensing towers (fig. 1), which are generally filled with coke, stones, or brick, through which a supply of water is kept running. The gas enters at the bottom of the first tower, passes upward, and descends the second, and is gradually absorbed by the water, forming strong liquid acid, which is run out by openings at the bottom of the condenser. So perfect is the system of condensation at some works, that of the acid produced by 100 tons of pure chloride of sodium, which should yield 62 tons, as much as $58\frac{1}{2}$ tons have actually been collected; and it has been instanced, as a curious illustration of this in another way, that Muspratt's great

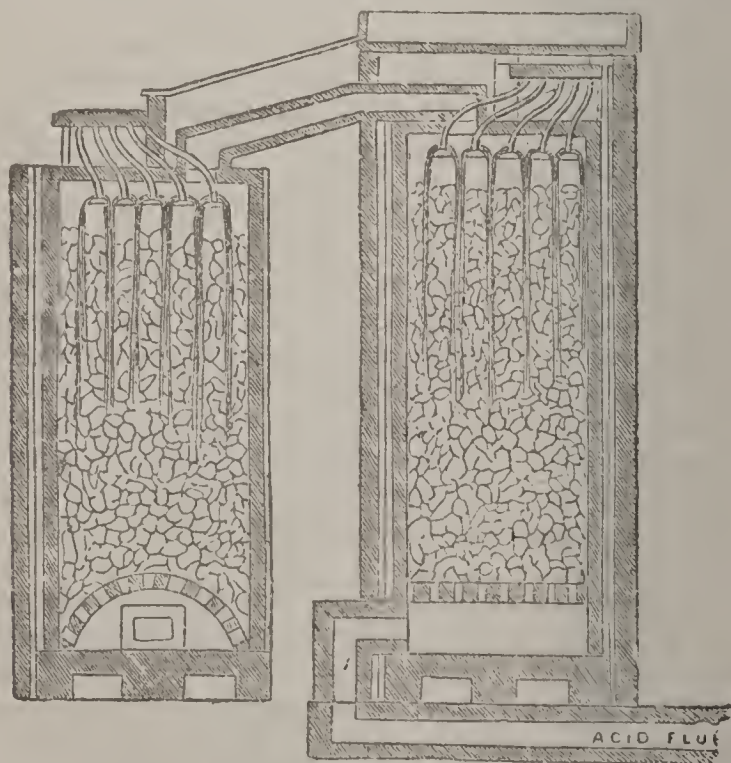


Fig. 1.—Section of Coke Tower for condensing Hydrochloric Acid Gas.

works, which were at one time forced out of Liverpool as a nuisance, have been established there again without protest.

Second Operation—Conversion of the Sulphate of Soda into

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Black-ash, called also Ball Soda.—This is effected by heating a mixture of sulphate of soda, carbonate of lime, and coal, in a reverberatory furnace. The proportions used are: sulphate of soda, 100 parts; limestone, 100–150 parts; coal 40–70

parts. The ‘balling furnace’ used in this operation is shown in fig. 2. It has two beds, one raised a few inches above the other. F is the fireplace, the waste heat from which is usually employed in boiling down the soda-lye as indicated in the section. The charge is thrown into the bed, A, of the balling furnace, after it has been raised to a bright red heat; and remains till it becomes sufficiently heated throughout the whole mass. It is then transferred to the *fluxing bed*, B, which is next the fire, and exposed to a higher heat, when it shortly begins to soften and flux into a mass like dough. In about half an hour the charge is withdrawn in red-hot state by the working door, and received into iron barrows, where it solidifies into blocks of crude soda, termed ball soda or black-ash. The revolving ball-furnace differs from the one shown above in having that portion of it for receiving the mixture of sulphate of soda, coal, and lime, in the form of a brick-lined iron cylinder, large enough in some instances to decompose 50 tons of the sulphate in 24 hours. This cylinder lies in a horizontal position, and is made to revolve slowly by engine-power. The materials are introduced by means of a hopper; the fireplace, which does not rotate, is placed at one end of the cylinder; and the arrangement for

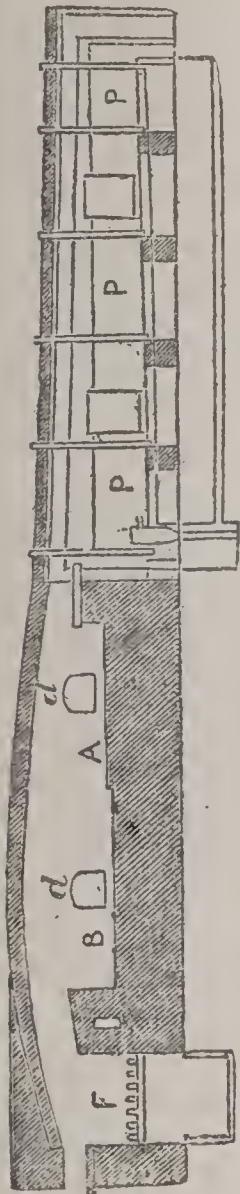


Fig. 2.—Section of Balling Furnace, showing an Evaporating Pan for Soda-lye in connection with it.

evaporating the lye is somewhat similar to that shown in the fig. This rotary furnace admits of the work being much better done than by the older reverberatory furnace, as it not only saves labor, but prevents loss of soda by volatilization.

In this process there is first a reduction of sulphate to sulphide of sodium with evolution of carbonic acid; then a conversion of the sulphide of sodium and calcium carbonate into sodium carbonate and calcium sulphide; finally the excess of calcium carbonate is reduced by the carbon to caustic lime and carbonic oxide.

Third Operation—Preparation of Carbonate of Soda from the Black-ash, by Lixiviation and Evaporation.—The apparatus is a series of four or more tanks, each having a false bottom and two outlet-pipes, and so arranged that the liquid part of the contents can flow from any one tank

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into any other. The method of working consists in making fresh water meet nearly exhausted ash, and the liquid passing on through the series of tanks and becoming gradually stronger, meets ash less and less exhausted, till in the last tank of the series the watery solution in its most concentrated state comes in contact with fresh black-ash. When the ash in the first tank is completely exhausted, the waste residue is withdrawn and a fresh charge introduced. It then becomes the last of the series, number 2 taking first place; and so the work goes on. The lye obtained is allowed to clear in a large tank, from which it is withdrawn for boiling.

The next stage is evaporation of the soda-lye, in a variety of ways. A common method consists in using the waste heat of the balling furnace, the flame from which passes over the surface of the liquor. With proper manipulation, the soda falls to the bottom; and is raked out at intervals through a side-door, and drained upon a sloping surface.

The soda-salts (chiefly carbonate of soda), thus obtained by evaporation of the lye, contain caustic soda which requires to be carbonated, and a little sulphide of sodium which it is necessary to exclude: they are accordingly transferred to a reverberatory furnace, and calcined, at a moderate heat, with sawdust, or sometimes with small-coal, the mixture being stirred with iron paddles. By this treatment, the caustic soda is converted into carbonate of soda, the sulphur is mostly expelled, and we now obtain the *soda-ash*, or alkali of commerce, which generally contains about 50 per cent. of real soda, Na_2O ; the other ingredients, besides the carbonic acid with which it is combined, being chiefly water, sulphur, and common salt. Sometimes it is further purified, and it is then known as *white alkali*.

Soda-crystals, commonly called 'washing-soda,' are obtained by dissolving the soda-ash in hot water, then filtering the solution and boiling it till the specific gravity reaches 1.3, when it is transferred to the crystallizing coolers. Bars of wood or iron are laid across these vessels to sustain the mass of crystals which form, and in ten days at most the crystallization is complete. Crystals of soda are purer than soda-ash but they are of much less value, weight for weight, because of the large quantity of water which enters into their constitution, amounting to $62\frac{1}{2}$ per cent.

The manufacture of caustic soda is an important branch of the alkali trade. For soap-making, bleaching, and several other purposes, carbonate of soda requires to be rendered caustic by quicklime. Manufacturers have, accordingly, taken to the plan of treating the black-ash liquor with hydrate of lime, and so obtain caustic soda at this stage, instead of sending it into the market as a purified carbonate of soda, for purposes where it requires to be decarbonated again. Another plan consists in mixing a small quantity of chloride of lime, or nitrate of soda, with the soda-lye from the black-ash. It is then concentrated into a strong

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solution, and finally brought to the state of a fused mass in round iron pots heated to redness. Great attention is now given to recovery of sulphur from the enormous 'waste heaps' which accumulate at all large alkali-works, since there is fully a ton of this 'waste' produced for every ton of common salt used. It consists largely of noxious sulphides of calcium, and is a source of river pollution, and, in warm weather especially, of atmospheric pollution. Mond's process, or some modification of it, is usually adopted. Some chemical changes are first produced in the waste by the action of common air, and the sulphur afterward precipitated by hydrochloric acid.

The *Ammonia Soda Process* was invented in England by Dyar and Hemming 1838, but economic difficulties prevented its adoption till it was improved by Ernest Solvay, Belgian chemist, 1861. It is now largely employed in soda manufacture in England and on the continent of Europe: all the soda manufactured in the United States from common salt is made according to this process. It consists in decomposing a solution of common salt with ammonium bicarbonate, whereby the greater part of the sodium is precipitated as bicarbonate, while the ammonia remains in solution as ammonium chloride. This is heated with lime to liberate ammonia, which is then reconverted into bicarbonate by the carbonic acid evolved in the conversion of the sodium bicarbonate into monocarbonate by heat; and the ammonium bicarbonate thus reproduced is employed to decompose fresh portions of sodium chloride, so that the process is made continuous. The chief advantages of this process are the direct conversion of the sodium chloride into carbonate, which is precipitated from the concentrated liquors uncontaminated with salts of other metals; the absolute freedom of the product from sulphur compounds; simplicity of plant, saving of fuel, and freedom from noxious vapors and troublesome secondary products.

In 1882 the world's product of soda was as follows:

| | Leblanc Soda. | Ammonia Soda. | Totals. | Ammonia Soda, per cent. |
|------------------|---------------|---------------|---------|-------------------------|
| | Tons. | Tons. | Tons. | |
| Great Britain... | 380,000 | 52,000 | 432,000 | 12·0 |
| France..... | 70,000 | 57,125 | 127,125 | 41·9 |
| Germany.. | 56,500 | 44,000 | 100,500 | 43·8 |
| Austria..... | 39,000 | 1,000 | 40,000 | 2·5 |
| Belgium..... | | 8,000 | 8,000 | 100·0 |
| United States... | | 1,100 | 1,100 | 100·0 |
| | 545,500 | 163,225 | 708,725 | 23·0 |

Since the table was compiled, the ammonia-soda process has gained largely on the Leblanc process on the continent of Europe, and, in less degree, in England. The U. S. product (1890) was over 60,000 tons. From various causes, the Leblanc process, so far as the production of soda itself is concerned, has ceased to yield any profit, and the hydrochloric acid evolved in the salt-coke

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process is now only moderately profitable; so that the process is now carried on mainly for the sake of certain secondary products derived from the Spanish and Portuguese pyrites employed, e.g., 3-4 per cent. of copper together with very small quantities of silver and gold, and an almost pure oxide of iron.

SODALITY, n. *sō-dāl'ī-tī* [L. *sodalitas* or *sodalitatem*, fellowship—from *sodālīs*, a mate, a fellow]: a fellowship; a fraternity; a brotherhood.

SODDEN, v. *sōd'n*: pp. of SEETHE, which see; boiled; seethed; applied to bread not well baked; doughy.

SODDEN, v. *sōd'n* [see SEETHE]: to soak; to saturate; to be soaked.

SODER, v. n. *sō'dér*: OE. for SOLDER.

SO'DIUM (symb. Na, at. wt. 23, sp. gr. 0.972): one of the metals of the alkalies, with properties closely resembling those of the allied metal, potassium. Duhamel (1736) discovered that potash and soda (now known to be the oxides of potassium and S.) were distinct bodies. Sir H. Davy first obtained the metal *Sodium* 1807. The symbol of the metal, Na, is the abbreviation of *Natrium*, from *Natron*, one of the old names of native carbonate of soda. S. is of a silver-white color, is somewhat more volatile than potassium, and further differs from that metal in having a higher fusing-point (about 208° F.) and a greater specific gravity. When placed on the surface of cold water, it decomposes the water with great violence: on hot water it takes fire at once, burning with bright yellow flame, producing a solution of soda. When heated in the air, it burns with its characteristic yellow flame, and is converted into sodium monoxide, Na_2O . When exposed *in vacuo* to a red heat, it assumes the form of vapor, and admits of distillation. Like potassium, it must be kept immersed in petroleum to exclude the oxidizing action of the air. As a reducing agent, it is little inferior to potassium, and as its combining power is lower, and it is obtained much more cheaply, it may usually be advantageously substituted for potassium in reducing operations. S. does not occur in the metallic form in nature, but its compounds are very widely distributed. It is found by far the most abundantly in the form of chloride of S. (or common salt), but it occurs likewise as albite or soda-felspar, cryolite (double fluoride of sodium and aluminium), borax (biborate of soda), trona (sesquicarbonate of soda), and Chili saltpetre (nitrate of soda).

The methods of obtaining S. are similar to those for obtaining Potassium (q.v.). Deville's method is regarded as the best for obtaining it in large quantity: Intimately mix 717 parts of dried carbonate of soda with 175 parts of finely powdered charcoal and 108 parts of finely ground chalk, knead them into a stiff paste with oil, heat them in a covered iron pot till the oil is decomposed, and finally distil them in an iron retort with precautions the same as in preparation of Potassium (q.v.). The object of adding the chalk is to prevent the separation of the charcoal from the car-

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bonate of soda when the latter fuses. This mixture ought to yield nearly one-third of its weight of sodium.

S. combines with all the elementary gaseous bodies; and two of these combinations—those with oxygen and chlorine—are of extreme importance.

With *oxygen*, sodium forms two compounds—viz., a monoxide, or anhydrous soda, Na_2O , and a dioxide, N_2O_2 . The latter is of no practical value. The non-oxide (soda) was formerly known as *fossil* or *mineral alkali*, to distinguish it from potash, which, from the source from which it was procured, was termed *vegetable alkali*. Anhydrous soda, Na_2O , is procured by burning the metal in dry air; it is of yellowish-white color, powerfully attracts moisture, and retains the water so firmly that it cannot be expelled by heat. Hydrated or caustic soda (S. hydroxide, $\text{Na}_2\text{O}, \text{H}_2\text{O}$, or NaHO) closely resembles, both in its properties and in the mode of procuring it, the corresponding potash compound. It is, however, not so fusible as the latter, and is gradually converted, by exposure to the air, into carbonate of soda, which also is an infusible salt in its anhydrous state. Solution of hydrate of soda (or soda-lye) is largely employed in the arts. It is prepared by boiling a moderately strong solution of carbonate of soda in milk of lime until a portion of the filtrate ceases to effervesce on addition of an acid. The solid hydrate has a specific gravity of 2.13, and the quantity of anhydrous soda in any solution may be closely approximated to by determining the specific gravity of the fluid at a temperature of 59°F. . A table for this purpose has been constructed by Schiff (quoted in Watts's *Manual of Chemistry*, 2d ed., I. 312).

Many of the combinations of the monoxide of S. (soda) with acids—constituting soda salts—are of great importance. Carbonic acid forms three salts with soda—viz., a normal carbonate, a sesquicarbonate, and a bicarbonate.

The *Normal or Ordinary Carbonate of Soda* (disodic carbonate, $\text{Na}_2\text{CO}_3, 10\text{H}_2\text{O}$), popularly known as the *Soda* of commerce, is a colorless, inodorous salt, with nauseous alkaline taste. It crystallizes in large transparent rhomboidal prisms, which contain nearly 63 per cent. of water, but it readily parts with all this water on application of heat. The crystals also lose the greater part of their water on mere exposure to the air, when they effloresce, and fall to powder. Water at 60°F. dissolves half its weight of the crystals, and boiling water considerably more, the solution acting like an alkali on vegetable colors. See SODA, MANUFACTURE OF.

Sesquicarbonate of Soda ($\text{NaH}_2(\text{CO}_3)_3, 2\text{H}_2\text{O}$) occurs native in large, hard, non-efflorescent prisms, in Hungary, Egypt, Mexico, etc., under the name *Trona* or *Natron*. When strongly heated, it loses one-third of its carbonic acid, and becomes converted into the preceding salt.

Bicarbonate of Soda (hydrosodic carbonate, NaHCO_3 , or $\text{Na}_2\text{CO}_3, \text{H}_2\text{CO}_3$) may be formed by passing carbonic acid through a cold solution of normal carbonate of soda; or by placing the crystals in an atmosphere of the gas, which is rapidly absorbed, while the crystals lose the greater part of

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their water, and pass into the new compound. The bicarbonate, prepared in either way, is a crystalline white powder. It requires 10 parts of water at 60° F. for solution, and has a much milder taste than normal carbonate. It is one of the constituents of baking-powders and of Seidlitz powders: see AERATED WATERS.

Sulphuric acid forms with soda a normal and an acid sulphate.

For *Normal or Ordinary Sulphate of Soda*, Na_2SO_4 , see its synonym, GLAUBER'S-SALT. The acid salt, or *bisulphate* of soda (acid sodium sulphate, $2\text{NaHSO}_4, 3\text{H}_2\text{O}$), is of no special interest.

The *Hypsulphite of Soda* (sodium thiosulphate, $\text{Na}_2\text{S}_2\text{O}_3$) occurs in large colorless, striated, rhombic prisms, of cooling and sweet taste. When strongly heated in the air, it burns with blue flame. It dissolves readily in water, depositing sulphur if the solution be kept in a closed vessel. It may be obtained by digesting a solution of sulphite of soda on powdered sulphur: the sulphur is gradually dissolved, and forms a colorless solution, which, on evaporation, yields crystals of hyposulphite of soda. This salt is largely employed in photography as a solvent for the unaltered silver chloride, and in paper-making as an antichlore. Sulphurous acid forms two salts with soda—a sulphite and a bisulphite. The *Normal Sulphite of Soda*, $\text{Na}_2\text{SO}_3, 7\text{H}_2\text{O}$, is obtained by passing sulphurous acid over carbonate of soda, dissolving the resulting mass in water, and crystallizing, when the salt is obtained in efflorescent oblique prisms, which fuse at 113° F., and are soluble in four parts of cold water, the solution having a slightly alkaline reaction and a sulphurous taste. This compound is commercially known as *Antichlore*, and is largely used in paper-manufactories for removing the last trace of chlorine from the bleached rag-pulp. The *Acid Sulphite* is of no importance. *Nitrate of Soda*, NaNO_3 , known also as *Cubic Nitre* or *Chili Saltpetre*, occurs as a natural product on the surface of the soil of some S. American districts: in most of its properties, except its crystalline form, and further in its being deliquescent, it resembles nitrate of potash. It is used considerably as manure. For the *Phosphates of Soda*, see PHOSPHATES. *Hypochlorite of Soda*, NaOCl , is at present only known in solution, in which it occurs as a yellowish-green fluid, evolving a smell of chlorine; it has strong bleaching power, and, when boiled, becomes decolorized, and evolves chlorine freely. It is formed by passing chlorine gas through a solution of carbonate of soda, the resulting solution containing the hypochlorite, with undecomposed carbonate and chloride of sodium. This solution is useful as a bleaching agent, an oxidizing agent in analytical chemistry, and a disinfectant agent. There are two *Borates of Soda*: for the important one, the *Biborate* or *Pyroborate*, see its ordinary title, BORAX. Various *Silicates of Soda* have been formed: for their properties, see GLASS—*Soluble Glass*.

The *Haloid Salts* of sodium resemble, in general characters, the corresponding salts of potash. Of these, by far

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the most important is *Chloride of Sodium* or *Common Salt*, formerly known as *Muriate of Soda* (NaCl). It occurs naturally in far greater quantity than any other soluble salt: see ROCK-SALT: SEA: WATER. The following are its leading properties: It crystallizes in colorless, transparent cubes, which are anhydrous, soluble in about 3 parts of cold water, and scarcely more soluble in boiling water. A saturated solution has a specific gravity of 1.205, the specific gravity of the salt being 2.125. It is insoluble in pure alcohol, is inodorous, and has a purely saline taste, unmingled with bitterness, unless chloride of magnesium be mixed with it. At a red heat, it fuses, and becomes converted into a transparent brittle mass. The well-known decrepitation which occurs when salt is thrown on the fire, or otherwise strongly heated, results from the sudden expansion of water mechanically entangled among its particles. The uses of this salt have been known from earliest times. It is an essential constituent of the food both of man and animals. It is regarded as a necessity even by the rudest nations. 'In several countries of Africa, men are sold for salt; among the Gallas and on the coast of Sierra Leone, the brother sells his sister, the husband his wife, parents their children, for salt; in the district of Accra (Gold Coast), a handful of salt, the most valuable merchandise after gold, will purchase one or even two slaves.'—Note to Liebig's *Letters on Chemistry*, p. 413. Chloride of S. is employed in the process of salting meat, for its powerful antiseptic properties: meat thus prepared loses, however, a considerable portion of its nutritive juices, which pass into the brine; and is less digestible than in its natural state. Among the purposes for which this salt is mainly employed are manufacture of the various salts of soda, especially the carbonate; preparation of hydrochloric acid; glazing of stoneware; preparation of soap; etc.—The other haloid salts—the iodide, bromide, and fluoride of sodium—require no notice.

The *tests* for the salts of S. are not satisfactory, because the metal forms scarcely any insoluble compounds. A salt of S. is usually concluded to be present when, the absence of all other bases having been proved, a saline residue remains, which, with dichloride of platinum, yields yellow striated prisms, $\text{NaCl}, \text{PtCl}_2 + 6\text{H}_2\text{O}$, by spontaneous evaporation. Before the blow-pipe, the salts of S. are known by the intense yellow which they communicate to the outer flame; and if a weak alcoholic solution of one of the salts is burned, a similar yellow tint is communicated to the flame. Spectrum analysis is too delicate to be of much practical use. The presence of $\frac{1}{200000}$ of a grain of S. in the flame is easily recognizable by the bright yellow line in the spectrum; and considering how universally diffused chloride of S. is, this fractional amount is not likely to be absent.

Medicinal Uses of the S. Compounds.—[Alphabetically.] *Acetate of Soda* is a mild diuretic, similar in operation to acetate of potash, for which it may be substituted: it may be given in doses varying from a scruple to a couple

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of drams. *Arseniate of Soda*, $\text{Na}_2\text{HAsO}_4, 12\text{H}_2\text{O}$, is serviceable, but only under professional advice, in periodic affections, chronic skin-diseases, and the cases in which arsenic is generally employed in medicine. It has all the advantages of arsenite of potash, and seems to cause less irritation of the stomach. A standard preparation of the arseniate is *Pearson's Solution*, which consists of one grain of the crystals of this salt dissolved in ten drams of distilled water. The *Liquor Sodæ Arseniatis* of the Pharmacopœia is much stronger. Paper impregnated with a solution of arseniate of soda sweetened with sugar is sold as a poison for flies. *Biborate of Soda*, or *Borax*, is employed principally as a topical astringent, and is used with advantage in aphthous eruptions of the mouth and throat. *Bicarbonate of Soda* is a most popular remedy in cases of dyspepsia, but its use is highly injurious when there are phosphatic deposits in the urine: see PHOSPHATIC DIATHESIS. *Carbonate of Soda* is not employed as an antacid so frequently as the bicarbonate, in consequence of its disagreeable taste; but in the dried state, when deprived by heat of its water of crystallization, it is much used as an alterative. As it has a very acrid taste, it should be combined, if given in powder, with some bland substance, such as Compound Tragacanth Powder. *Solution of Chlorinated Soda* (known also as *Solution of Chloride of Soda*, *Chlorinated Soda*, *Hypochlorite of Soda*, and *Labarraque's Disinfecting Liquor*) is preferable to hypochlorite of lime in destroying noxious effluvia, as the salt which is left does not deliquesce, while chloride of calcium is very deliquescent. It may be applied locally to foul ulcers, either in lotion (2 drams to 8 ounces of water, or as a poultice with linseed-meal and boiling water. *Phosphate of Soda*, $\text{Na}_2\text{HPO}_4, 12\text{H}_2\text{O}$, is a mild saline purgative, with far less unpleasant taste than sulphate of magnesia. It is especially adapted as a purgative for persons affected with deposits of red gravel (lithic or uric acid) in the urine. For *Salicylate of Soda*, see SALICYLIC ACID. For *Sulphate of Soda* and *Tartrate of Soda and Potash*, see their ordinary titles, GLAUBER'S-SALT and ROCHELLE SALT.

SODOM, *sōd'om*, APPLE OF: name given to the fruit of a species of *Solanum* (q.v.). But it seems that the true APPLE OF SODOM, or MAD APPLE, of the shores of the Dead Sea, mentioned by Strabo, Tacitus, and Josephus, and described as beautiful to the eye, but filling the mouth with bitter ashes if tasted, is a kind of gall, growing on dwarf oaks, and produced by a species of gall-insect, *Cynips insana*. These galls are about 2 inches long, and $1\frac{1}{2}$ inch in diameter, of a beautiful, rich, glossy, purplish-red color, and filled with an intensely bitter, porous, and easily pulverized substance, surrounding the insect. They are attached to the twigs in a curious manner, different from other galls, the narrow end 'rising upward on each side, and bending inward, so as to clasp the extremity of the twig somewhat like a pair of wide and curved nippers.'

SODOMA—SOE.

SODOMA, or **SODDOMA**, *sōd'ō-mā* (properly **SODONA**, or **SODDONA**): 1479–1549, Feb. 14: Italian painter: b. Vercelli, Piedmont. His name was Giannantonio Bazzi (corrupted into Razzi): Sodona, with which name his pictures were signed, appears to have been a family name. A pupil of Giovenone of the Lombard school, he combined its strong coloring and other characteristics with those of the school at Siena, where he spent most of his life. He was among the first there to develop fully the Cinquecento manner. He completed, adding 17 frescoes, the life of St. Benedict in the monastery of that saint at Monte Oliveto, where the monks named him Madcap, from his gaudy dress and frolicsome spirit. At Rome, his Vatican frescoes were replaced by Raphael's. In the Chigi palace (now Farnesina) he painted scenes from the life of Alexander. A gift by him of the *Death of Lucretia* to Pope Leo X. procured him the title Cavaliere. His finest works are at Siena. In St. Catherine's Chapel in S. Domenico is his admired picture of that saint in ecstasy. In S. Francesco are the *Deposition from the Cross*, and *Christ Scourged*—regarded by many as his masterpieces. At Pisa is a *Sacrifice of Abraham*, and in Florence a *St. Sebastian*. He was a master in expression, motion, and color, though often hasty and careless.

SOD'OM AND **GOMORRAH**, *go-mōr'rah*: two ancient cities of Syria, almost invariably spoken of in conjunction in the Bible, and forming with Admah, Zeboiim, and other towns, the 'cities of the plain,' which, for the enormous wickedness of their inhabitants (indicated in the term Sodomy), are said to have been overthrown—not submerged—by some terrible convulsion of nature. Modern writers on sacred topography are not agreed as to the precise site of these cities, no trace of which remains; the majority holding that they stood on the s. shore of the Dead Sea, near the salt hill of Usdum; while others, apparently with more countenance from the Scripture narrative (Gen. xiii. 10–13), maintain that Sodom and the other 'cities of the plain' stood in the 'circle or plain of the Jordan,' e. from Bethel and Ai, near where the river enters the Dead Sea. The popular belief that the cities were miraculously overwhelmed by the waters of the Dead Sea, and that their remains may still be seen at the bottom, is an idle tale of superstitious travellers, uncountenanced either by any visible fact or by the account in Scripture.

SODOMITE, n. *sōd'ō-mīt*: an inhabitant of *Sodom*; one guilty of an unnatural crime, attributed to the inhabitants of Sodom. **SOD'OMY**, n. *-mī*, the sin of Sodom. **SOD'OMIT'ICAL**, a. *-mīt'ī-kāl*, pertaining to sodomy. **SOD'OMIST**, n. *-mīst*, one guilty of sodomy.

SOD'OR AND **MAN**, **BISHOPRIC OF**: see **HEBRIDES: MAN, ISLE OF**.

SOE, n. *sō* [AS. *saa*; F. *seau*; Ger. *sau*, saw]: tub with two handles, carried by means of a pole passing through the handles; a large wooden vessel for water.

SOEMMERING'S GAZELLE—SOFALA.

SOEMMERING'S GAZELLE, *söm'méh-rīngz ga-zěť* [after Dr. Samuel Thomas *Soemmering*, a German anatomist]: in *zool.*, *Antilope Soemmeringii*, from e. Abyssinia. It is about 30 in. high, sandy fawn above, with massive lyrate horns, which are more slender in the female.

SOEMMERING'S MIR'ROR, *söm'méh-rīngz*: instrument for drawing objects under the microscope. It is a plane mirror of polished steel, less in diameter than the pupil of the eye, supported opposite the focus of the eyepiece. It inverts the objects.

SOEST, *söst*: t. of Prussia, province of Westphalia, 36 m. s.e. of Münster by railway. During the middle ages, S. was a Hanse-town and fortress, and, in commercial importance, one of the foremost cities of Germany, with pop. 60,000—70,000. Now it is only the shadow of its former self; but relics of its ancient splendors are seen in its numerous and magnificent churches, of which the finest is the 'Meadow Church,' restored 1850—82: it is 'a pearl of Gothic architecture.' The municipal law of S., the *Jus Susatense*, was the oldest in Germany, and served as the model for the other imperial free-towns, Lübeck, Hamburg, etc. At present, S. has some trade in corn, and extensive breweries. Pop. (1885) 14,848.

SOEVER, *sō ēv'ēr* [*so*, and *ever*]: only used in composition to extend or render emphatic the sense of who, what, where, when, etc.

SOFA, n. *sō'fă* [F., Sp. *sofa*; Ar. *suffah*, a sofa—from *saffa*, to dispose in order]: a long seat with stuffed bottom, back, and ends. **SOFA-BED**, or **SOFA-BEDSTEAD**, a sofa so contrived as to include a bed.

SOFALA, *sō-fă'lă*, or **CEFOLA**: region on the e. coast of Africa, from the delta of the Zambezi to Delagoa Bay, i.e., lat. 18°—26° s. This stretch of coast now comprehends the Portuguese captaincies of Rio de Senna, Tetê, Sofala, and Inhambane, besides the regions round Delagoa Bay, nominally under the crown of Portugal, the extent inland being generally limited by the mountain region parallel to the coast of s. Africa, and forming a belt of low country about 150 m. wide, full of swamps, densely wooded, and generally unfavorable to European life: see **MOZAMBIQUE**.

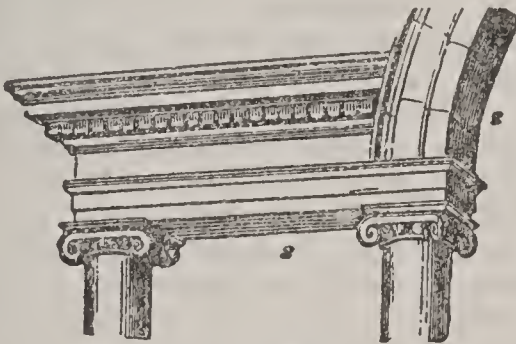
S., in common with the remainder of the coast of e. Africa, was conquered by the Arabs between the 8th and 12th c.; it was visited 1480 by Pedro Cavalho, a Portuguese capt., from Abyssinia, before the route by sea to India was discovered. In 1500 the Portuguese, under Albuquerque, commenced making settlements on this coast, and built a strong fort on an island in the mouth of the Rio de S., near a town which was founded 200 years before by the Arabs, and which still exists, though in decay. The inland region at the back of the coast district, now occupied by the Transvaal Boers toward the s., or by the Amatabele to the n., and stretching n. for an indefinite distance, formed the celebrated though mythical empire of Monomotapa, the accounts of which by the early travellers are marvellous. S. was considered by the old

SOFFIT—SOFIA.

geographers as a very rich, gold-producing country, and was by some judged (without sufficient basis) to be the Golden Ophir to which King Solomon every three years sent a fleet of ships. S. has long ceased to produce much gold.

Although nominally under Portuguese rule, yet that authority rarely extends outside the walls of the miserable forts held by its agents. It is computed that on the whole of the Portuguese settlements on the e. coast of Africa there are not more than 500 colonists of European birth. The natives, generally, are of the negro type, gradually approximating to the more intellectual Zulu Kafir as we proceed from the Zambezi to Delagoa Bay. Principal exports are ivory, bees-wax, hides, and rhinoceroses' horns: clandestine traffic is said to be carried on in slaves. Considerable amounts of gunpowder, lead, coffee, and European clothes find their way up from the coast to the Boer settlements in the highlands of the interior. The coast-line is generally low and sandy; and dangerous to approach, on account of shoals and sand-banks. A group of islands, called Bazaruta, lie off the coast n. of Cape San Sebastian, lat. 22° s. The best harbor is that of Inhambane, and ships may ascend to the town, about 8 m. from the mouth of the river. The harbor at the mouth of the Rio de Sofala is difficult of access on account of its bar.

SOFFIT, n. *sŏf'fit* [F. *soffite*—from It. *soffitta*, a soffit—from L. *suffixus*, fastened beneath or below—from *sub*, under; *figo*, I fix]: in *arch.*, the under-side of an arch or



s, s, Soffits.

cornice, presenting a flat surface, and often formed into panels, as over windows, etc.; in *scene-painting*, a border.

SOFI, n. *sŏf'ī* [Pers. *sŏfi*]: a priest or monk of Persia; a dervish; a religious person. SO'FISM, n. *-fīz'm*, the mystical doctrines of the SO'FIS, *-fīz*.—See SUFISM.

SOFIA, or SOPHIA, *sŏ-fē'ā*: city, cap. of Bulgaria since 1878; 42° 42' 30" n. lat., 23° 15' 30" e. long.; 170 m. n.w. of Adrianople, very favorably situated in a fertile plain, 1,755 ft. above sea-level, between the granite mass of the Vitosh Mts. and the Sumughu and the Etropol ranges of the Balkans. At S. is the junction of 5 great routes between Nish and Belgrade, Lom and Vidin, Plevna and Rustchuk, Philippopolis and Constantinople, and Kostendil and Salonica. The town is on the railroad from Belgrade to Constantinople; the region is intersected by the Kire-

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sena, the Bladaiska, and the Bojana, tributaries of the Isker, which are connected by ditches. The climate is subject to great seasonal and diurnal changes—the annual range of temperature being from -4° in Jan. to 100° in Aug., while the daily variation is often 27° or more. S. is the seat of a Bulgarian abp. or metropolitan. Of the numerous mosques, the most notable is that of Buyuk-Jami, with its 9 gilded metal cupolas; of greater historic interest is the old Sophia mosque (Hagia Sophia), originally a Christian chh., and now again consecrated to Christian rites. Since S. became the cap. of Bulgaria, a 'European' town has grown up around the royal palace in an e. suburb: the remainder of the city retains its Turkish character. The industries of S. are weaving of fabrics of wool and of silk, and dyeing; also cultivation of fruits and tobacco. Its situation makes it a commercial centre for the Balkan peninsula. Exports are hides and skins (to Vienna), and especially goat-skins (to Marseilles); principal imports are wheat, maize, and alcoholic liquors.—Anciently S. was called Sardica. Here about 343 was held a church council.—Pop. (1877) 13,000; (1888) 30,248, of whom 5,500 were Turks and 5,000 Jews; (1900) 67,920.

SOFT, a. *sōft* [Dut. *zacht*; Ger. *sacht*, *sanft*; Low Ger. *sagt*; AS. *sefte*, soft: in one sense comp. Gael. *saobh*, foolish, deranged]: not hard; easily yielding to pressure; not rough; not violent; smooth to the touch; flowing; easily yielding to persuasion or any influence; impressible; gentle; mild; delicate; weak; simple; not unfeeling; not strong or glaring; pleasing to any sense; not tinged with salts, as water; in *OE.*, still; easy: AD. softly; gently; quietly: INTERJ. hold! stop! N. in *slang*, one weak in intellect; a foolish person. **SOFT'LY**, ad. *-lī*, without hardness; not forcibly; not loudly; gently; mildly. **SOFT'NESS**, n. *-nēs*, the quality of being soft; smoothness; delicacy; mildness; effeminacy. **SOFT'ISH**, a. *-īsh*, somewhat soft. **SOFTEN**, v. *sōf'n*, to make soft; to grow soft; to mollify; to calm; to make less harsh or severe; to make less glaring; to grow less obdurate, cruel, or rude. **SOFT'ENING**, imp. *-ning*: ADJ. making less hard or fierce: N. the act of making less hard or cruel, etc.; in *paint.*, the blending of colors into each other. **SOFT'ENED**, pp. *-nd*: ADJ. made less hard or harsh. **SOFT'ENER**, n. *-nēr*, one who or that which softens. **SOFT'Y**, n. *-ī*, a foolish person. **SOFT-HEADED**, a. of weak intellect. **SOFT-HEARTED**, a. susceptible of pity; meek; gentle. **SOFT-SAWDER**, *-saw'dēr* [corruption of Eng. *soft-solder*: comp. Ger. *suade*, gift of the gab]: flattery; something that easily pleases and tickles. **SOFT-SPOKEN**, a. having a mild or gentle voice; affable. **SOFTENING OF THE BRAIN**, in *pathol.*, disease of which there are three forms, the white, the red, the yellow. The white, or atrophic, softening occurs in the white substances of the hemispheres: it arises from imperfect nutrition, and occurs often with other diseases in weakly persons approaching old age. Red softening, formerly attributed to prior inflammation, may arise from abrupt obstruction of an artery. Yellow softening is an idiopathic disease, local

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around an inflamed spot, an apoplectic clot, etc.; it soon runs a fatal course. See BRAIN. TO WALK SOFTLY, in *OE.*, to be weak and out of spirits, as by excessive grief.—*SYN.* of 'soft, a.': ductile; facile; malleable; flexible; yielding; tender; timorous; mild; gentle; kind; meek; civil; pusillanimous; complaisant; effeminate; delicate; fine; weak; simple; smooth; flowing;—of 'soften': to mollify; compose: mitigate; palliate; alleviate; enervate.

SOFTA, or SOPHTA, n. *sōftā* [said to be from Pers. *suchteh* or *sokhta*, burnt with fire—from the supposition that they were similarly burning with the thirst for knowledge]; term applied generally to young men of Turkish race in Constantinople and throughout Turkey, who, as the superior race, are, without exception, engaged in professional studies for offices in the church, the law, the army, or the state. The term is often restricted to students of the Koran.

SOFTENING AND INDURATION: terms used to express a pathological diminution and augmentation of the consistence of the tissues or organs of the body. These changes may arise from inflammatory action; but softening may be induced also by causes totally distinct from inflammation, e.g., from deficient supply of blood, from scrofula or cancer, or from long-continued functional inactivity (as in the case of paralyzed muscles). Among the parts liable to both softening and induration are the brain and spinal cord, the heart, the lungs, the serous and mucous membranes, the liver, the spleen, the kidneys, the uterus, and the bones and cartilages.

SOFT'-GRASS (*Holcus*): genus of grasses having a lax panicle, two-flowered spikelets, with two nearly equal glumes. The species are not numerous. The English name is from the soft and abundant pubescence of the British species, which are two in number, CREEPING S. (*H. mollis*) and WOOLLY S. or MEADOW S. (*H. lanatus*), both perennial grasses, and both very common. Meadow S. is found most abundantly on damp, moorish, or peaty soils, on which it is sometimes sown, as it yields abundant herbage; but it is very inferior to some other grasses, and unsuitable for rich meadows and pastures. Creeping S., generally on dry, sandy, or other light soils, much resembles Meadow S., but is still more downy, and smaller. The roots sometimes extend 5 or 6 ft. in a season. They contain much nutritious matter, and are very acceptable food to horses and cattle, but especially to hogs, which grub them up for themselves.

SOGDIANA, *sōg-dī-ā'nā*: prov. of the Persian empire in the time of Darius; now Samarcand and Bokhara. After Alexander's conquest, S. and Bactria formed one satrapy. It was governed by Greek dynasties till the middle of B.C. 2d c., when the Bactrian Greek kingdom was overwhelmed by the flood of Scythian invaders.

SOHAR—SOIL.

SOHAR, *sō-hâr'*: town and port in Oman, Arabia; on the Sea of Oman. It has a commodious, sheltered harbor; is fortified by a heavy wall and castle; has populous and fertile surroundings; manufactures woollen, cotton, and silk goods; and has large trade. It is older than Islam, was held by the Persians before the Moslem conquest, lost its early commercial prestige, became a ruin about 1230, and for centuries was the object of contention among native tribes. Pop. (1883) estimated 4,000–5,000.

SOHO, int. *sō-hō'*: an exclamation used to attract the attention of a person at a distance.

SOI-DISANT, a. *swaw-dē-zāng'* [F.]: calling himself; would-be; pretended; self-styled.

SOIGNIES, *swā-nyē'*: town of Belgium, province of Hainault, 22 m. s.w. of Brussels by railway. The field of Waterloo is a few miles n.e. of S. Its church of St. Vincent Maldegair, built in the 12th c., is probably the oldest in Belgium; it occupies the site of a monastery founded by Vincent 650. S. has breweries, distilleries, trade in stone and lime, and large fairs. Pop. (1885) 8,643.

SOIL, n. *soyl* [OF. *soil*, the mire wherein a wild boar wallows: Sw. *sōla*, to wallow: Dan. *sōle*, to daub, to dirty; *sōl*, mire, mud]: filth; any foul matter upon another substance; a stain; dung: V. to tarnish; to defile; to pollute; to dirty; to besmear; to bedaub. **SOIL'ING**, imp. **SOILED**, pp. *soyld*: ADJ. stained; tarnished. **SOILURE**, n. *soyl'ūr*, in *OE.*, stain; pollution. **SOIL-PIPE**, the pipe that conveys from a dwelling-house foul or waste water. **TO TAKE SOIL**, to run into the water, as a deer when pursued.—**SYN.** of 'soil, n.': dirt; pollution; spot; foulness; dung; compost; manure;—of 'soil, v.': to dirty; dirt; besmear; daub; bedaub; pollute; defile; foul; befoul; begrime; bemire; bespatter; tarnish; stain; sully; contaminate.

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SOIL, n. *soyl* [F. *sol*—from L. *solum*, the ground, soil]: the upper stratum of the earth; mold; country; land.—*Soils* are those portions of the surface of the earth in which plants can grow. They have been and are constantly being formed from the rocky surface of the ground. This has been disintegrated by mechanical and chemical action, and has been mixed with vegetable and animal matter which has decayed and become incorporated with the original substance. The thickness of S. varies from 2 to 12 or more inches. Underlying the soil is the subsoil, which, from the almost entire absence of organic matter, is of different color and usually of closer texture. The processes of disintegration and decay which have formed, and are still working upon, the soil are more slowly going on in the subsoil, and are aiding to repair the waste which in cultivated fields results from the removal of crops, and to increase the quantity of plant food in ground not under cultivation. The subsoil rests on the rock, which forms the principal portion of the earth.

The composition of soils depends on the character of the rocks from which they have been formed. It is not, however, in all cases similar to that of the immediately underlying rock. By the action of glaciers, floods, rivers, winds, and other forces, many soils have been transported long distances from the places in which they were formed. Among the disintegrating forces to whose action the formation of soils is due, are the air, which exerts a powerful chemical action; changes of temperature, by which the particles of rock are separated from each other; rain, which has a strong mechanical action combined with great solvent power; the growth of plants, which act by insuring a circulation of moisture, separating particles of the rock, and by the corrosive action caused by their decay; and the work of earth-worms, which bring fresh earth to the surface, and, through the channels which they make, admit water and air to the subsoil. Even in regions where there is no frost and little rain, the rocks gradually waste away through the action of the acids and ammonia liberated by the dew. In cultivated soils the process of disintegration is greatly accelerated by the operations of tillage (see **TILLAGE**). In addition to the original materials of the rocks from which they were formed, soils contain vegetable mold, formed by decay of vegetation, and which has important influence on plant growth. In many places, decayed animal matter also adds to the value of the soil for productive purposes.

What are known as drift-soils are seldom stratified, contain stones and rocks, and are supposed to have been brought, in many cases from long distances, to their present position by the action of glaciers. Alluvial soils have been deposited by running water, and colluvial soils consist of a mixture of the drift and the alluvial. Soils vary greatly in texture as well as in origin. Between the sandy soil, which is the most open, and the clayey soil, the most compact, there are various intermediate soils called loams, which are described as sandy loams or clayey loams as they approach in composition the sand or the clay. Sandy

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soils sometimes contain as much as 90 per cent. of sand, are warm, and are easy to work. They are deficient in organic matter, but vary greatly in productiveness. The quartz sand is nearly barren, but sand from some other rocks is moderately fertile. A radical defect of very sandy soils is their extreme porosity, which not only renders them unable to hold sufficient water for the full development of crops, but also allows the rapid leaching of the valuable elements of the manure and fertilizers applied to the land. Closely allied to sand are the gravelly soils, which also suffer from drought on account of the looseness of their texture, and which are in such coarse particles that the elements of fertility which they contain are largely unavailable. At the other extreme are the clay soils, which often have liberal quantities of plant food, but are too retentive of moisture, and are thus made difficult to work. Unless thoroughly drained, they are liable to fail, by reason of drought or excessive rainfall, to produce a good crop. Calcareous and marly soils contain lime in considerable proportions, and the better grades are very fertile. In soils known as vegetable molds, there is quite a percentage of organic matter. Peat contains large quantities of vegetable matter, but needs to be worked and exposed to the air in order to sweeten and prepare it for profitable cultivation. Loams are, practically, mixtures of several of the soils above described—sand, clay, lime, and organic matter being represented in their formation. Both as relates to ease of cultivation and to productiveness, these soils hold high rank. The terms heavy and light as applied to soils do not refer to actual weight, but to the degree of resistance which they offer to the operations of tillage. By weight, clay soils are lighter than those which are sandy, but the clay are known as heavy, and the sandy as light.

The fertility of soils, which makes them valuable for production of food, varies not only with the character of the rocks from which they were formed, and with their texture, but also in respect to the condition in which the elements required by plants appear. It is not only absolutely necessary that lime, potash, phosphoric acid, sulphuric acid, magnesia, and oxide of iron be contained in the land, but in order to render it fertile it is equally requisite that these elements appear in a readily available form. Only a very small proportion, however, when compared with the mass of the soil, is required to be in condition for immediate use. A fair crop of wheat, including grain and straw, takes less than 150 lbs. of mineral elements from an acre of land. The weight of the soil, allowing it to be 10 or 12 in. deep, on that area is 3,000,000 to 4,000,000 lbs., and it contains many thousand lbs. of the mineral matters required by crops. Yet on land which has been long tilled it often occurs that these elements, in even the very slight proportion requisite to produce a crop, are not found in a condition in which they can be used by plants; and that, on account of this slight deficiency, a full yield of grain can be secured only by supplying plant

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food from some other source. The locking up of these valuable elements in nearly insoluble forms is a beneficent provision against their rapid and utter exhaustion from the land either by wasteful methods of cultivation or by natural agencies. Under the present conditions, the disintegrating processes of nature and the decay of organic substances in and upon the ground assist greatly in maintaining the fertility of properly cultivated soils, and tend to the enrichment of those from which the vegetation is not removed.

Soils can be injured by cropping without manure, particularly by growing the same crop for many years in succession; by plowing in such a manner as to allow the washing away of the finer particles; by leaving the surface bare for long periods, thus showing the rapid escape of the nitrates and other valuable elements by leaching and by exposure to the sun and wind; by allowing water to remain stagnant upon them; and by working them at improper times.

The improvement of soils can be effected in various ways, depending on their character and location. Those which are shallow can be gradually deepened by the plow; those of imperfect texture can sometimes be ameliorated by mixing with them those of an opposite nature, as clay with sand, and sand with clay; and those suffering from a lack of moisture or an excess of water can be benefited by irrigation or by drainage. Deficiencies in fertility, whether due to the original character of the land or to impoverishment by cultivation, can be largely supplied by tillage (see TILLAGE: SUBSOILING), and by application of manures and special fertilizers (see MANURE: FERTILIZERS). There are, however, no means by which all classes of crops can be grown in any given locality, as climate exerts an influence on plant growth which, except within very narrow limits, man has no power to control.

Exhaustion of Soils: abstraction of the elements of fertility to such an extent as to render the land unprofitable for cultivation. Soils may become poor by having their finer particles blown away by the wind, or by leaching; but in ordinary use the term exhaustion indicates impoverishment by the growth and removal of crops. No fertile soil can be absolutely exhausted. However excessive the drain from it may be, the disintegrating processes of nature will remain in constant operation, and will slowly but surely liberate the elements needed for plant food. The land contains these elements in such abundance that they can never be entirely removed. But when crops are taken from the soil, the processes of repair are not sufficiently rapid to meet the demand, and if fertilizing material is not applied, the soil will become so impoverished as to fail to yield paying crops. When this point is reached the land must be allowed to 'rest,' i.e., remain uncropped till the recuperative forces of nature have accumulated a supply of plant food in an available form; or else man must apply to the soil a sufficient quantity of the deficient elements to enable it to be productive.

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The only organic element which it is possible to exhaust from soils is nitrogen. This is absolutely indispensable to plant life and growth. It can be supplied in guano, sulphate of ammonia, nitrate of soda, bone meal, oil-cake, cotton-seed meal, fish-scrap, dried blood, and in clover and other crops to be used as green manures (see MANURE—*Green Manure*). These materials also supply other important elements. In some soils one or more of the following mineral elements—magnesia, lime, soda, sulphuric acid, and chlorine—appear in very small quantities, and may become exhausted, but such cases are comparatively rare. The mineral elements which are frequently exhausted, and which are partially exhausted from, and must be supplied to, nearly all soils long under cultivation, are phosphoric acid and potash. Among the sources of supply of phosphoric acid are bones, superphosphate of lime (bones treated with sulphuric acid), phosphate rock, and guano. Potash is largely obtained from the great potash mines in Stassfurt, Germany, and sold in various forms as sulphate, muriate, and kainit; from wood-ashes; and from various minor sources.

It is possible for the soil to become exhausted as regards production of a particular crop, and yet be very far from exhausted as regards various other crops. This is partly because some plants are much more delicate feeders than others, and are not able to utilize the stores of food in the soil as fully as the more vigorous classes can, and partly because the different crops use the important elements of fertility in widely varying proportions. A soil deficient in phosphoric acid may be unable to yield a profitable crop of a class which requires large proportions of this element, and yet may be in fair condition to grow plants which need much nitrogen and little phosphoric acid. With the resources now at command, the farmer can prevent exhaustion of any of the important elements from fertile soils, can restore the equilibrium where it has been impaired, and can bring the so-called exhausted soils to high fertility. Whether the restoration of badly impoverished soils will be profitable will depend on the cost of the fertilizers needed, the distance from markets, the prices which crops will command, and other considerations varying with the cases of individual farmers.

SOIL, v. *soyl* [prov. Eng. *soul*, to be satisfied: F. *soûler*, to glut: OF. *saoul*; F. *soûl*, satiated—from mid. L. *satulus*; L. *satur*, full, sated]: in *agri.*, to feed cattle with green food in the stall or yard. SOIL'ING, imp.: N. the practice of feeding cattle in stalls or yards with fresh-cut grass or clover. SOILED, pp. *soyld*.—*Soiling* is practiced largely in Germany and France, and to some extent in this country. Where not fully adopted, this system is often partially followed as supplementing the deficiencies of pastures in drought (see FODDER—*Green Fodder*). The principal objection to soiling is in the large amount of labor which it involves—so great as to prohibit the adoption of the system where land is cheap and the pastures are fairly good. On high-priced land, especially near cities

SOIRÉE—SOJOURN.

and large towns in which milk can be sold, it has been found an economical method of keeping cows. Among the benefits of the system are the ability which it gives to keep a much larger number of animals than could otherwise be maintained on a given area of land; the saving of great expense for fencing; the saving of all the manure, thus enabling the farmer to make his land very rich; great increase in the quantity of milk or beef obtained; and the prevention of the growth of weeds. Crops are selected, and seed is sown, so as to have an abundance of feeding material through the entire growing season. On part of the land, two crops can be grown in a single summer. The cutting is done each day, in such quantity as is required for immediate use. On dairy-farms, grain is often added to the fodder, to increase the production of milk. Among the crops grown for soiling are rye, clover, lucerne, oats, millet, Indian corn, sorghum, and various grasses. The soiling system can be practically continued through the winter by the use of ensilage (see ENSILAGE).

SOIRÉE, n. *swaw-rā'* [F. *soirée*, evening—from F. *soir*, evening—from L. *sērus*, late: It. *sera*, evening]: an evening-party for conversation; a public meeting in the evening at which refreshments are distributed. **SOIRÉE MUSICALE**, *mū'zī-kāl'* [F.]: an evening entertainment of music.

SOISSONS, *swā-sōng'*: town of France, dept. of Aisne, in a fertile vale on the river Aisne, about 65 m. n.e. of Paris: it is a station on three railroads, the Paris and Laon, Compiègne and S., and Reims and S. S. is the key of Paris for an army invading France from the Netherlands, and is the meeting-point of six military roads. The principal building is the cathedral, founded in the 12th c., whose library contains many rare MSS. There are also some remains of the great castellated abbey of St. Jean des Vignes (founded 1076), where Thomas à Becket found refuge in exile. Quite near S. is an institute for 'deaf and dumb,' on the site of the famous abbey of St. Médard, where Clothaire and Siegbert were buried. S. has manufactures of linen, woollens, and cottons. S. is one of the oldest towns in France, famous even in the time of the Romans, when it bore the names first of *Noviodunum*, afterward of *Augusta Suessionum*: hence its modern name. It was the last Roman stronghold in Gaul that withstood the arms of Clovis, who here overthrew Syagrius, the Roman commander, 486, and made it the seat of the Frankish monarchy, which it long continued to be. **Pop.** (1886) 11,850.

SOJOURN, v. *sō'jérn* [F. *séjourner*; It. *soggiornare*; OF. *sojorner*, to sojourn—from a supposed mid. L. *sub-diurnārē*, to wait over the day—from L. *sub*, under, and *diurnus*, daily—from *dies*, a day]: to dwell for a time; to tarry; to abide: N. a temporary residence. **SO'JOURNING**, imp.: N. the act of dwelling in a place for a time. **SO'-JOURNED**, pp. *-jérnd*. **SO'JOURNER**, n. *-ér*, one who sojourns or dwells in a place for a time; a temporary resident.

SOJOURNER TRUTH—SOLANACEÆ.

SOJOURNER TRUTH, *sō-jěrn'ěr tróth* (original name, **ISABELLA**): colored woman, a lecturer and reformer: about 1775-1883, Nov. 26; born in slavery in Ulster co., N. Y. The N. Y. emancipation act 1817, freeing all slaves over 40 years of age, freed her, but she did not gain her liberty until 1827. In 1851 she began lecturing on slavery in w. New York, and afterward lectured on politics, temperance, and women's rights in other states. She could neither read nor write, but was well informed on many subjects, and had a naturally ready wit and a gift of pointed expression. She called herself Sojourner, claiming to have heard this name whispered to her by the Lord; and to this name she added that of Truth. She acquired considerable property. She died at Battle Creek, Mich.

SOKE: see **Soc**.

SOKOTO, *sō-kō'tō*: kingdom of Africa, in Sudan, s.w. of Lake Tchad, and separated from it by the state of Bornu (q.v.); 117,000 sq. m. The inhabitants, mostly of the Haussa race, are numerous. A formidable military force is maintained.—*Sokoto*, former cap., stands on the Zirmie, affluent of the Sokoto which flows into the Quorra; pop. 20,000-22,000. S. trades in raw silk, glass-wares, and perfumery, and has extensive and famous manufactures of leather goods.—The present cap. is Wurno (pop. 12,000), with active trade: it is the residence of the sultan of S., and is a few m. n.e. of Sokoto.

SOL, n. *sōl* [L. *sol*, the sun]: an old term in emblazoning arms, equal to *or*, or gold; the sun with a human face surrounded with rays; an old term for gold.

SOL, *sōl*: silver coin in Peru: see **SOLIDUS**.

SOL, *sōl*: in *music*, the fifth note of the diatonic scale = G. **SOL-FA**, v. *sōl-fá'*, to sing or vocalize the diatonic scale to the syllables *do, re, mi, fa, sol, la, si*; to sing, as a learner, a musical composition with these syllables. **SOL-FA'ING**, imp. *-ing*: N. the act or practice of singing the diatonic scale, or a musical composition to the syllables *do, re, mi, fa, sol, la, si*. **SOL-FAED'**, pp. *-fád'*.—See **SOLFEGGIO**: **TONIC SOL-FA**.

SOLACE, n. *sōl'ās* [OF. *solaz*, solace—from L. *solātium*, a soothing, solace—from *solor*, I comfort: It. *solazzo*]: that which cheers, comforts, or consoles; that which alleviates grief or anxiety; that which relieves in distress; recreation; amusement; in *OE.*, happiness: V. to cheer; to comfort; to console; to relieve in affliction; to soothe; to allay; in *OE.*, to take comfort. **SOL'ACING**, imp. **SOL'ACED**, pp. *-āst*, cheered in affliction. **SOL'ACEMENT**, n. *-mēnt*, the act of solacing; comfort.—**SYN.** of 'solace, v.': to cheer; animate; encourage; enliven; exhilarate; comfort; console; assuage; allay; alleviate; relieve.

SOLANACEÆ, *sōl-ā-nā'sē-ē*, or **SOLANEÆ**, *sō-lā'nē-ē*: natural order of exogenous plants, mostly herbaceous plants and shrubs, but including a few tropical trees. The leaves are mostly alternate, undivided, or lobed, without stipules. The flowers are regular, or nearly so; the calyx and corolla

SOLANDER—SOLANUM.

generally 5-cleft; the stamens generally five. The fruit is either a capsule or a berry, mostly 2-celled. Most of the plants of this order are natives of tropical countries, a small number extending into the temperate and moderately cold climates of both hemispheres; in the coldest regions they are entirely lacking. They are mostly distinguished by an offensive smell, and by containing in greater or less abundance a narcotic, poisonous substance, usually associated with a pungent principle; and some are among the most active poisons. Sometimes the narcotic substance predominates, as in Mandrake (q.v.) and Henbane (q.v.); sometimes the pungent substance predominates, or is alone present, as in Cayenne Pepper (*Capsicum*); sometimes both are present in more or less proportion, as in Tobacco, Thorn-apple or Stramonium, and Belladonna. The fruit is generally poisonous; but that of a considerable number of species, in which acids and mucilage predominate, is eatable; e.g., the berries of the Winter Cherry and other species of *Physalis*, those of the Egg-plant (q.v.) and some other species of *Solanum*, and of the Love-apple (*Lycopersicum*). The tubers, which occur in a few species, contain much starch, and serve as food, of which the Potato (q.v.) is the chief example (see SOLANUM). The seeds of all contain a fixed oil, which in s. Germany is expressed from the seeds of the Belladonna itself.

SOLANDER, n. *sō-lăn'dēr* [F. *solandre*]: a disease in horses.

SOLAN-GOOSE, n. *sō'lăn-gós*, or SOLAND, n. *sō'lănđ* [Icel. *sula*, a solan-goose]: web-footed sea-fowl, found on parts of the coasts of Great Britain and Ireland, etc.; the Gannet (q.v.).

SOLANO, n. *sō-lá'nō* [Sp. *solano*—from L. *sol*, the sun]: hot s.e. wind which occasionally visits the Spanish peninsula, from the direction of the African deserts, extremely hot and loaded with fine dust: see SIMOOM.

SOLANUM, n. *sō-lă'nũm* [L. *solānum*, nightshade: It. *solano*: F. *solanum*]: the nightshade; systematic name of several plants, of which some are edible, as the potato, and others poisonous—of ord. *Solanaceæ* (q.v.). SOLANINE, n. *sōl'ă-nĩn*, highly poisonous substance obtained from several species of *solanum*—called also SOLANI'A, n. *-nĩ'ă*. SOL'ANA'CEOUS, a. *-nă'shũs*, belonging to the order of plants which includes the nightshade and the potato.—*Solanum* is a genus containing a great number of species, distributed all over the world, but abundant particularly in S. America and the W. Indies. Some species are herbaceous, others are shrubs; some unarmed, some spiny; many covered with a down of star-like hairs. The flowers are in false umbels, or almost in panicles; seldom in racemes, or solitary. The anthers open by two holes at the top. The berries are two-celled, and contain many smooth seeds. The species of this genus almost always contain in all their parts a poisonous alkaloid, *Solanine*, in greater or less quantity, sometimes so much that the leaves or the berries cannot be eaten without danger, while in a

SOLAR—SOLAR MICROSCOPE.

few species the quantity present is insignificant, and these parts are eaten freely, being agreeable and harmless. By far the most important of all the species is *S. tuberosum*, the POTATO (q.v.), in which, however, Solanine is found in considerable quantity, so that not only the herbage, but the juice of the raw tubers, is unwholesome. Of the species with eatable fruit, the principal is *S. melongena*, the EGG-PLANT (q.v.).—The species *S. dulcamara*, the BITTERSWEET (q.v.), and *S. nigrum*, the COMMON NIGHTSHADE (q.v.), both possess poisonous and medicinal qualities. The berries, leaves, bark, and roots of various species are employed for different medicinal uses in the warm countries of which they are natives; but their properties have not yet been sufficiently investigated. The berries of *S. saponaceum* are used as a substitute for soap.

SOLAR, a. *sō'ler* [F. *solaire*—from L. *solāris*, belonging to the sun—from *sol*, the sun]: pertaining to the sun, or proceeding from it; measured by the apparent revolution of the sun; sunny; in *anat.*, having branches of filaments like the rays of the sun: N. upper chamber or loft; usually the only private apartment in ancient baronial halls—placed over the pantry at one end of the hall, and used as parlor and sleeping-room for the baron and his family. SOLARIZATION, n. *sō'ler-ī-zā shŭn*, injurious effects of too long exposure to the sun's rays, as to a photograph; excessive insulation. SOLAR CYCLE (see CYCLE OF THE SUN, under CYCLE: also PERIOD). SOLAR DAY, SOLAR MONTH, portions of time marked by the apparent motion of the sun (see CALENDAR: DAY: MONTH: YEAR. SOLAR FLOWERS, flowers that open and close at particular hours of each day. SOLAR PLEXUS, in *anat.*, great plexus of sympathetic nerves supplying the intestines. SOLAR SPOTS, dark spots that appear on the sun's disk when viewed through a telescope. SOLAR YEAR, the space of time measured by a complete revolution of the earth round the sun, being 365 d., 5 h., 48 m., 51·6 s.

SOLAR MICROSCOPE: instrument for producing magnified images of minute objects on a screen, through the agency of the sun's rays (see MICROSCOPE). The tube of the microscope is conical, and is fastened to the interior side of a closed window-shutter over a hole in the latter; a reflector placed at the hole so that the rays of light may fall on it is so adjusted as to throw them along the tube. They are then collected by a powerful double convex lens, and thrown on the object, which is inserted into the tube at the focus of the lens by a slit at the side. After passing the object, the rays again pass through a single lens, or a combination of lenses, make their exit from the tube, and fall on a screen, on which they depict a magnified image of the object. We have here supposed the object to be so translucent as to allow the passage of rays through it. Should it be opaque, the rays of light reflected from the mirror are caught by the double convex lens, which concentrates them on another mirror near the opposite end of the tube; they are thence reflected on the back of the object and diverge on the system of lenses at the mouth,

SOLAR MOTOR—SOLAR SYSTEM.

which form the image. Instead of the sun's rays, the oxy-hydrogen lime-light (and recently the electric light) has been employed, its rays being thrown on the double convex condenser by a concave reflector, in whose focus the light is situated. The instrument is hence often called the *Oxyhydrogen Microscope*.

SOLAR MOTOR: apparatus for utilizing the sun's rays in producing motion. Various attempts have been made to utilize the radiant energy of the sun; notably by Ericsson, Tellier, and Mouchot. Mouchot's motor is based on the use of a large conical mirror which by proper machinery (heliostat) is made continually to face the sun. In the axis of the conical mirror a blackened tubular boiler was placed. Silver-plated copper was the material of the mirror. The sun's rays concentrated on the tubes raised the temperature of the water above the boiling-point. The tubes were jacketed with glass to retain the heat. About $1\frac{1}{4}$ hours were required to attain the boiling-point; after that 8 minutes under favorable conditions would raise the pressure 15 lbs. per sq. inch. As high pressure as 7 or 8 atmospheres were attained; and it is recorded that a steam-pump was worked by it, lifting 46,000 gallons of water per hour for a short time with a steam-pressure of 3 atmospheres. The conical mirror in this case had an opening of about 16 ft. in diameter. Ericsson proposed a glass mirror forming a portion of a parabolic cylinder, made up of strips of silvered glass. At the focal point was a cylindrical heater or boiler. Ericsson up to the last period of his life maintained his faith in the solar motor. In summer-time in New York latitudes he claimed that the sun acting on a surface of 100 sq. ft. developed 1,850,000 foot-pounds of mechanical energy. He had great faith in the applicability of his invention to working irrigating pumps in the clear atmosphere of the west. Hitherto no practical success has been attained with any form of solar motor, of which these two are typical specimens. Ericsson, however, drove a steam-engine, with 6-inch piston and 8-inch stroke, at 120 revolutions per minute with steam at 35 lbs. per sq. inch. This trough, as he termed the mirror, was 11 ft. long and 16 ft. wide, with a 12-inch-wide opening in its centre directly back of the boiler.

SOLAR SYSTEM: the sun, and the planets, comets, and meteoric rings revolving round the sun, viewed in their mutual relations: called sometimes the Planetary System. It is probable that each star is the centre of an analogous system: this, however, is merely a speculation. No change of much magnitude can take place in the elements of the planets without having effect on the earth and its inhabitants, on account of the mutual attractions of the planets for each other; in fact, they appear as members of one family, bound together by common ties, which could not be ruptured in the case of one individual without general shock to the others. For the various members of the solar system, see **PLANETS: PLANETOIDS: COMET: SUN: MOON: SATELLITES: METEORS.** For their motions, see **GRAVITATION: CENTRAL FORCES: PRECESSION:**

SOLATIUM - SOLDER.

ETC. It remains here only to give the more interesting numerical facts connected with the planets.

| Name. | Diameter in Miles. | Density, Earth's being = 1. | Mass, Earth's being = 1. | Distance from Sun in Millions of Miles. | Period of Revolution in Days. | Velocity in Orbit—Miles per Hour. | Velocity of Rotation at Equator—Miles per Hour. |
|----------------|--------------------|-----------------------------|--------------------------|---|-------------------------------|-----------------------------------|---|
| Mercury | 3,058 | 1.12 | 0.065 | 35 | 88 | 105,330 | 386 |
| Venus | 7,510 | 1.03 | 0.885 | 66 | 225 | 77,050 | 1,010 |
| Earth | 7,926 | 1.00 | 1.000 | 91½ | 365½ | 65,533 | 1,040 |
| Mars | 4,263 | 0.70 | 0.108 | 139 | 687 | 53,690 | 628 |
| Minor Planets. | | | | | | | |
| Jupiter | 84,846 | 0.24 | 300.860 | 476 | 4,332 | 28,744 | 27,985 |
| Saturn | 70,136 | 0.13 | 89.692 | 872 | 10,759 | 21,221 | 21,538 |
| Uranus | 33,247 | 0.17 | 12.650 | 1,754 | 30,687 | 14,963 | 10,921 |
| Neptune | 37,276 | 0.16 | 16.773 | 2,746 | 60,127 | 11,958 | ? |
| Sun | 865,000 | 0.25 | 316,000 | * | * | * | 4,407 |
| Moon | 2,160 | 0.60 | 0.01238 | * | * | 2,273 | 10 |

SOLATIUM, *sō-lā'shĭ-ŭm* [L., consolation]: in Scotch law, compensation for wounded feelings, something over the ordinary pecuniary value of the damage. In the general common law such a ground of damages is not in strict principle admitted, but in practice there is no substantial difference.

SOLD, n. *sōld* [F. *solde*—from L. *solidus*, a gold coin]: in *OE*, military pay; warlike entertainment.

SOLD, v. *sōld*: pp. pt. of **SELL**. **SOLD-NOTE**, a note or memorandum of sale given by the seller to the buyer.

SOLDAN, n. *sōl'dān*: *OE*. for **SULTAN**.

SOLDER, n. *sōd'ēr* or *sōl'dēr* [*OF*. *souder* or *soulder*, to consolidate, to close or fasten together—from L. *solidārē*, to make firm—from *solidus*, firm: It. *saldo*, solid, firm]: metallic composition for uniting or cementing metals; fusible alloy. Solders are of various kinds suited to different metals. They always require to be used with a flux, such as borax, resin, chloride of zinc, sal-amoniac, etc. The following are the principal solders: *Peewterer's S.*—bismuth, 2 parts; lead, 4 parts; tin, 3 parts: this can be used for coarse work by direct application of naked fire; but for fine work, requiring the protection of a muffle-furnace, the composition must be bismuth and lead, of each 1 part; tin, 2 parts. *Plumbers' S.* for coarse work—tin, 1 part; lead, 3 parts. For finer work—tin, 2 parts; lead, 1 part. *Spelter S.*—12 parts of zinc to 16 parts of copper. *Soft Spelter S.*—equal parts of copper and zinc. When **S.** is applied in the common work of plumbers and tinmen, a tool called the soldering-iron is used: this is made red-hot and forms a convenient means of applying fire direct to the **S.** and flux. Although called the soldering-iron, the portion of the tool to be heated must be copper. In many manufactures, a flame produced by a mixture of atmos-

SOLDIER.

pheric air and coal gas is used to melt the S.; and for fine work, such as jewelry, the common blowpipe is often used. **SOLDER**, v. to unite metals by the fusion of a metallic cement; to mend; to unite anything broken. **SOL'DERING**, imp.: N. the process of uniting metals by fusing a metallic composition. **SOL'DERED**, pp. *-dér'd*, united or cemented by a metallic composition. **SOL'DERER**, n. *-ér-ér*, one who or that which solders. **HARD SOLDER**, solder which only fuses at a red heat. **SOFT SOLDER**, a solder which fuses at a comparatively low heat.

SOLDIER, n. *sōl'jēr* [OF. *souldart*; F. *soldat*; It. *soldato*, a soldier; It. *soldo*; F. *solde*, pay; hire: L. *solīdus* or *soldus*, a gold coin]: man engaged in military service; a warrior; one engaged in war; a private. **SOL'DIERLY**, a. *-lī*, or **SOLDIER-LIKE**, a. becoming a real soldier; brave. **SOLDIERSHIP**, n. martial skill; military qualities or character; conduct becoming a soldier. **SOL'DIERING**, n. *-īng*, the state of being a soldier; the occupation of a soldier. **SOL'DIERY**, n. *-ī*, soldiers collectively; the body of military men. **SOLDIER-CRAB**, a crustacean which, having part of its body unprotected, occupies the empty shell of a shell-fish; the hermit-crab.—A *soldier* is one who enters into an obligation of military service to some chieftain or government to devote for a specified period his whole energies, and if necessary his life itself, to that service, for furtherance of the policy of that chief or government. The consideration may be immediate pay, or prospective reward; or the soldier's contract may be merely an act of loyal devotion. The acknowledgment of the service by the employer constitutes the man a S., and empowers him to take life in open warfare, without being liable to the penalties of an assassin and a robber. The fact of being mercenary, that is, of receiving wages for killing and being killed, does not render a soldier's trade less honorable. He bears arms that others may be protected, or may not be compelled to fight: he is precluded by the exigences of military training from maintaining himself by peaceful occupation; it is therefore but fair that those whom he protects should support him, and give him beside actual maintenance, reasonable wages for the continual risk of his health and life. If a man willingly enlist himself as a S. in what he believes an unrighteous cause, it is an act of moral turpitude; but once enlisted his service can be demanded and enforced by his employer. Obedience, implicit and entire, is his first virtue. The maxim is: 'The military force never deliberates, but always obeys.' See **ENLISTMENT: MARTIAL LAW WAR. ETC.**

SOLDIERS' HOMES—SOLDO.

SOLDIERS' HOMES: institutions, either national or state, as asylum, temporary or permanent, for invalid or disabled soldiers of the United States. An act of congress, 1851, Mar. 3, provided for a model Soldiers' Home, near Washington, on a site of 200 acres, since extended to 500 acres, and constituting a beautiful park, with spacious marble buildings worthy of the national capitol. The funds used came from the city of Mexico, being the tribute levied by Gen. Scott at the close of the Mexican war, with some other moneys appropriated by congress. Those entitled to the benefits of the Home at Washington are: 1, soldiers of 20 years' service; 2, those invalid or disabled in consequence of service; 3, pensioners who surrender their pensions. Good character is a condition of admission, and on recovery of health any inmate is discharged. A board of commissioners, made up of officers of the highest rank, controls the administration of the Home, through a gov. of the Home, who is one of their number. The inmates, 1890, numbered about 1,200, besides about 250 temporary inmates. The expenses are about \$200,000 a year.

The number of veterans of the civil war (in which were called out 2,778,304 men for military service) has required an extended system providing asylum for invalid and disabled volunteers. A National Soldiers' Home was established by act of congress, 1865, and its system further developed 1873. To meet the wants of all parts of the country the institution has been planted at various points; viz., Dayton, O., Togus, Me., Milwaukee, Wis., Leavenworth, Kan., Hampton, Va., Santa Monica, Cal., and Marion, Ind.

The action of the national govt., providing these S. H., has been supplemented by many state Homes. That of N. J. at Kearney was the first, the state having authorized it by act 1865, Mar. 23. It has nine buildings, and nearly 300 inmates. That of N. Y., incorporated 1863, but not constructed until 1877-79, has 30 attractive buildings, and accommodates over 1,000 inmates, at a cost for ten years of \$1,130,861. It is at Bath, Steuben co. In Penn. the Home, at Erie, is a building covering an area 370 ft. sq., with capacity for 600 persons. It was opened 1886, Feb. 3. The Home at Sandusky, O., established 1886, with capacity for 700, has 18 buildings and about 500 inmates. The Home of Ill., at Quincy, has a grand central building, 17 cottages, and several other buildings, with room for 900, and about 600 present, 1890. It was organized 1885. At Grand Rapids, Mich., the Soldiers' Home, organized 1885, has a single very large and elaborate building, with capacity for 400 inmates. The Home of Wis., at Waupaca, established 1887, has a group of cottages, where over 50 men, some with wives, and a number of soldiers' widows, are provided for. At Yountville, Cal.; Grand Island, Neb.; Hot Springs, S. Dak.; Fort Dodge, Kan.; Minnehaha Falls, Minn.; Tilton, N. H.; Noroton, Conn.; Bennington, Vt.; Chelsea, Mass.; and Bristol, R. I., are other state Homes, amply organized and liberally maintained.

SOL'DO: see **SOLIDUS**.

SOLE.

SOLE, n. *sōl* [F. *sole*; Ger. *sohle*; Sw. *sola*; L. *sōlēa*, the sole of the foot or of a shoe: W. *sail*, foundation, groundwork: Gael. *sail*, a beam of wood: L. *solum*, the ground or earth]: the bottom of the foot or of a shoe; the part of a thing which forms the bottom: a certain flat sea-fish (see below): the bottom or lowest part of an embrasure: V. to furnish with a sole. **SOL'ING**, imp. **SOLED**, pp. *sōld*. **SOLE-LEATHER**, the thick leather to form soles to shoes. **SOLE SHOE**, the long bottom part of the plow which supports its weight upon the ground at the bottom of the furrow, and which serves as a slide.

SOLE, a. *sōl* [OF. *sol*; F. *seul*—from L. *solus*, alone]: single; individual; being or acting without another; alone; only; solitary. **SOLE'LY**, ad. *-lī*. **SOLE'NESS**, n. *-nēs*, the state of being alone. **FEMME SOLE**, in *law*, an unmarried woman.

SOLE (*Solea*): genus of Flat-fishes (*Soleidae*), of oblong form, with rounded muzzle, which almost always advances beyond the mouth; the mouth twisted to the side opposite to that on which are the eyes—the eyes being usually on the right side, though individuals of the same species are found having the eyes and color on the left; the teeth very small, in both jaws, but only in the under part of the mouth (the *side* opposite to the eyes); the lateral line straight; pectoral fins on both sides; the dorsal and anal fins long, and extending to the tail, but distinct from the tail-fin.—The **COMMON S.** (*S. vulgaris*) is a highly esteemed fish, abundant on the British coasts where the bottom is sandy, and of which great quantities are brought to market. They are caught by trawling, seldom with bait. The S. is in condition for the table during the whole year except five or six weeks in Feb. and Mar., its spawning-time. The Common S. is found on all coasts of Europe, except the most northern. It has been known to attain 26 inches length, and almost 12 inches width, weighing 9 lbs.; but a S. less than half that weight is reckoned very large. The upper size of the body is of almost uniform dark brown; the scales small, rough to the touch, and ciliated at the edge; the lower side is white. The S. sometimes ascends rivers to a considerable distance from the sea, and seems to thrive as well in fresh as in salt water. It breeds freely enough in fresh water.—The **LEMON S.** (*S. pegusa*), less frequently taken, is equally esteemed for the table.—The name S. is popularly extended to several genera which have been separated from the true soles. In *Brachirus*, the dorsal and anal fins are united with the tail fin; but, as in *Solea*, there are pectorals on both sides: to this genus belongs the **ZEBRA S.** (*B. zebrinus*) of Japan.—In *Monochirus*, the pectoral fin is developed only on the upper side: to this genus belong the **VARIEGATED S.** (*M. variegatus*) and the **LITTLE S.** or **SOLENETTE** (*M. linguatulus*); both small. In genera *Achirus* and *Plagusia*, the pectorals are lacking on both sides.

On the Pacific coast of N. America, the name S. is given to various species of the family *Pleuronectidae*, the common

SOLEAFORM—SOLEN.

market species being *Lepidopsetta bilineata*, averaging 3 lbs. The New York Sole (*Achirus mollis*), of the same family, is irregularly banded, and only 6-8 in. long.

SOLEAFORM, a. *sōl-ē'ă-fawrm* [L. *sōlēa*, a sandal; *forma*, shape]: in *bot.*, slipper-shaped.

SOLECISM, n. *sōl'ē-sīzm* [Gr. *soloikis'mos*, any incongruity of language; said to be from *Soli*, town in Cilicia, whose Greek inhabitants corrupted the Greek language and used a mixed dialect]: any glaring deviation from the established usage of a language in speaking or writing; any impropriety or barbarism of speech extending beyond single words; any absurdity or impropriety. **SOL'ECIST**, n. *-sīst*, one guilty of an impropriety in language. **SOL'ECIS'TIC**, a. *-tīk*, or **SOL'ECIS'TICAL**, a. *-tī-kāl*, incorrect or incongruous in language. **SOL'ECIS'TICALLY**, ad. *-lī*. **SOL'ECIZE**, v. *-sīz*, to commit a solecism. **SOL'ECIZING**, imp. **SOL'ECIZED**, pp. *-sīzd*.

SOLEMN, a. *sōl'ēm* [L. *solemnis*, or *solemnis*, religious, solemn: Sp. *solemne*; F. *solennel*; It. *solenne*, solemn]: marked with religious gravity or pomp; affecting with seriousness; attended with religious rites; adapted to impress seriousness or reverence; having the appearance of seriousness or gravity; serious; reverential; devotional; sacred, as an oath. **SOL'EMNESS**, n. *-nēs*, the state or quality of being solemn; reverential manner. **SOL'EMNLY**, ad. *-lī*, in a solemn, grave, or stately manner; with religious ceremonies; with due state or form. **SOLEMNITY**, n. *sōl'ēm'nī-tī*, an impressive religious ceremony; manner of acting adapted to impress awe; impressiveness; gravity; steady seriousness. **SOLEMNIZE**, v. *sōl'ēm-nīz*, to celebrate or perform with religious ceremonies; to perform religiously at stated times; to render or make serious or reverential. **SOL'EMNIZING**, imp. **SOL'EMNIZED**, pp. *-nīzd*. **SOL'EMNIZER**, n. *-nī zēr*, one who solemnizes. **SOL'EMNIZA'TION**, n. *-nī-zā'shūn*, the act of solemnizing; celebration. **SOLEMN-BREATHING**, a. diffusing solemnity; impressing with seriousness. **SOLEMN LEAGUE AND COVENANT**, in *Scot. hist.*, written bond of confederacy entered into among the nobility, gentry, burghers, and others for suppression of popery and prelacy, accepted by the Scot. parl. 1638, adopted by Eng. parl. 1643, sworn to by Charles II. before he was crowned by the Scots at Scone, 1651; but after the Restoration it was rejected by Charles II., and ordered by him to be burned by the common hangman (see **COVENANTS, THE**).—**SYN.** of 'solemn': grave; serious; sober; reverential; devout; formal; sacred; devotional.

SOLEN, *sō'lēn*: genus of lamellibranchiate mollusks, type of a family, *Solenidæ*, remarkable for the wide gaping of the shell at both ends, and the large and muscular *foot*. In the genus *S.*, the shell is remarkably elongated, its apparent length being, however, more strictly its breadth. From its form the names **RAZOR-SHELL** and **RAZOR-FISH** are often given to it. The species are numerous, and inhabit the sands of all seas except in the coldest parts of the world. Some tropical species have shells of great beauty. The

SOLENOID—SOLEURE.

solens burrow in sand, making their hole straight down, and ascending and descending by means of the foot, which is capable of being elongated and contracted to bore a passage for the animal, and to drag it through. They are used for food, also by fishermen for bait. To obtain them, a hooked iron implement is used. Another method is to drop salt on the mouth of the hole, which causes them to come up, when they are quickly seized. A common species, *S. siliqua*, is about an inch in length, and eight inches in breadth: it is perfectly straight. Another species, *S. ensis*, is curved like a sword.

SOLENOID, n. *sō' lēn-oyd* [Gr. *sōlēn*, a channel, a tube; *eidos*, resemblance]: a continuous copper wire having one part straight, and the other twisted as an open spiral around the straight part, which, when an electric current passes through it, acts as a magnet.

SOLENT, *sō' lēnt*: w. portion of the strait between the Isle of Wight and the mainland of England. At Hurst Castle, which guards its entrance on the s.w., the S. is less than a mile wide; and along this narrow passage the tide flows with a rapidity which at certain times no boat can stem. The castle itself consists of a central keep, surrounded by several smaller towers, and mounted with heavy guns.

SOLEURE, *so-lér'* (Ger. *Solothurn*): canton in n. Switzerland, bounded w. and s. by Alsace and Bern, n. and e. by Basel and Aargau; 300 sq. m. The greater portion of the canton is fertile and well cultivated, especially along the banks of the Aar. Even the rugged and hilly districts are sources of wealth on account of their fine pasturage. Besides grain, the principal products of S. are fruit and livestock. Kirschwasser, a sort of cherry-brandy, is a very important article of trade. Of the people, 42 per cent. are engaged in mining and manufacturing industries, chiefly watch-making, machine-construction, metallurgy, paper-making, wool-manufacture, silk-manufacture, and shoe-manufacture. S. entered the Swiss Confederation 1481, with Freiburg. Its constitution is liberal. The legislative body is the grand council, consisting of one member for each 650 of population. The members are, since 1856, chosen directly by the people, who have besides a veto on the laws passed by the council. The executive is chosen by the council, and consists of 5 members. Pop. (1888) 85,720, nearly all German-speaking: Rom. Catholics were to Protestants as 5 to 1; there were less than 200 Jews, and about 150 of other religions.

SOLEURE' (Ger. *Solothurn*): city, cap. of the canton of S.; on the Aar, 16 m. n.n.e. of Bern by railway. The scenery in its vicinity is among the loveliest in Switzerland. The Aar flows through the town, dividing it into two unequal parts connected by three wooden bridges. The most notable building is the cathedral of St. Ursinus, with cupola and façade of Corinthian columns, reckoned the most costly cathedral in Switzerland. S. has some manufactures, but derives its chief industrial importance from its transit-trade. Pop. (1880) 7,668, three-fourths Rom. Catholics.

SOLEY—SOLFEGGIO.

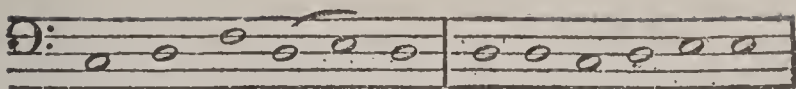
SOLEY, *sō'li*, JAMES RUSSELL: author: b. Roxbury, Mass., 1859, Oct. 1. He graduated at Harvard Univ. 1870; was appointed asst. prof. of English at the U. S. Naval Acad. 1871, and prof. of English studies, history, and law; commissioned prof. in the navy 1876; detailed for duty at the Paris exhibition and to investigate the methods of European naval colleges 1878; transferred to Washington to collect and arrange the library of the naval dept. 1882; made supt. of publications of the naval records of the civil war 1883; lecturer on international law at the Naval War College 1885; and appointed asst. sec. of the navy 1890; July 16. His publications include: *History of the Naval Academy* (1876); *Foreign Systems of Naval Education* (1880); *The Blockade and the Cruisers* (1883); *The Rescue of Greeley*, in conjunction with Capt. W. S. Schley (1885); *European Neutrality during the Civil War* (1888); and contributions to *The Battles and Leaders of the Civil War* and *The Narrative and Critical History of America*.

SOL-FA: see **SOL 3**: **SOLFEGGIO**.

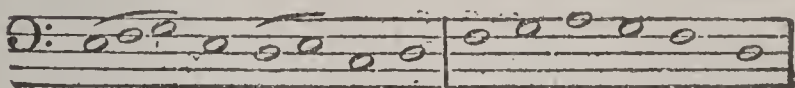
SOLFATARA, n. *sōl'fā-tā'rā* [*Solfatara*, volcano near Naples—from It. *solfo*, sulphur, brimstone]: volcanic fissure or vent from which sulphurous vapors, hot mud, and steam are erupted: the most notable are in Italy, in the Antilles, in interior Asia, and in Java. The original S., that of Pozzuoli, near Naples, is an irregular plain, 1,368 ft. long, 1,310 ft. broad, almost surrounded by broken hills of pumaceous tufa, the ancient walls of the crater. From the crevices of the rocks, steam or noxious gases, chiefly sulphuretted hydrogen, mixed with a minute quantity of hydrochloric acid and ammonium chloride, exhale. In the cracks and fissures of the rocks, sulphur, alum, and sulphate of iron abound. The vapors exhaled are used for medicinal baths; and huts of boards have been erected in which the baths may be obtained. The Soufrière of Morne-Garon, in the isle of St. Vincent, Lesser Antilles, about three m. in circuit, and more than 500 ft. deep, has in its centre a cone, whose summit is covered with sulphur. There are solfataras in the Yellowstone National Park, and in Lake co., Cal. **SOLFATARITE**, n. *sōl-fāt'ār-īt*, a name applied to the soda-alum found at Solfatara, near Naples.

SOLFEGGIO, n. *sōl-fěj'ī-ō* [It.]: system of marking the notes of the musical scale with syllables instead of the letters C, D, E, F, G, A, B; intended to aid learners to sing at sight. Seven syllables are used in this nomenclature for the seven notes of the scale. In singing, the art of applying these syllables to the notes, as an exercise for the learner, is called *Solmization*. The syllables are *ut* (or *do*), *re*, *mi*, *fa*, *sol*, *la*, and *si*. The first six are the commencement of the lines of Paulus Diaconus's (8th c.) hymn to John the Baptist, which had this peculiarity, that the first syllable of each line was sung to a note one degree higher than the first syllable of the line that preceded so as to present the type of a scale:

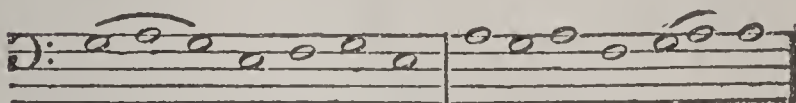
SOLFEGGIO.



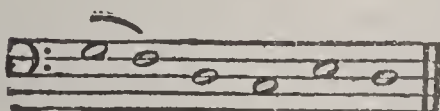
Ut que - ant lax - is Re - so - na - re ñ - bris



Mi • ra ges - to - rum Fa - mu - li tu - o - rum



Sol • ve pol • lu • ti La - bi - i re - a - tum



Sanc - te Jo - han - nes.

These syllables are said to have been used first by Guido of Arezzo, 11th c. (see GUIDO ARETINO); and Le Maire, French musician of the 17th c., added to them *sz*, for the 7th of the scale. When applied to the key of C, their equivalents, in the ordinary musical nomenclature, are:

| | | | | | | | |
|----|----|----|----|-----|----|----|----|
| Do | re | me | fa | sol | la | si | do |
| C | D | E | F | G | A | B | C. |

These syllables may, however, according to the modern practice of teachers in this country, be applied to other keys, with *do* always as the key-note, so as to express not the absolute pitch of a note, but its relation to the key-note; and thus used, they are thought to be of service to the learner in keeping prominently before him the principle that there is in music but one scale, which is raised or lowered according to the pitch of the key. Variations in the way of using the syllables have recently given rise to short and easy modes of teaching singing, the best known of which is Curwen's system of 'Tonic Solmization,' commonly known as Tonic Sol-fa (q.v.); in which the ordinary notation of the staff, with its lines and spaces, is entirely rejected, and a notation substituted which is formed of the solfeggio syllables, used to express not pitch, but relation to the key-note. One disadvantage urged against this and similar schemes is the entire withdrawal of the direct indication of the pitch of the sounds to the eye, by the notes ascending as the sounds ascend, which is so prominent a feature of the common notation. It is urged also, that even if the rudiments of music can be taken up with remarkable ease by the pupil who learns on the tonic sol-fa system, he

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will be beset with difficulties as soon as he comes in contact with notes of different lengths, or begins to modulate from one key to another. The further objection is urged, that the pupil thus taught is shut out from the whole historic world of musical literature: see TONIC SOL-FA.

SOLFERINO, *sōl-fā-rē'nō*: village of n. Italy, province of Mantua, 20 m. n.w. of Mantua. It stands on a hill, and has a tower called the Spy of Italy (*Spia d'Italia*), from which the whole plain of Lombardy can be seen. There, 1796, the French conquered the Austrians. S. was again the scene of a great victory 1859, June 24, by the French and Italians over the Austrians.—Pop. (1881) 649.

SOLICIT, v. *sō-līs'it* [F. *solliciter*, to request—from L. *sollicitārē*, to stir up, to urge—from *sollicitus*, roused, anxious—from *sollus*, whole, entire; *ciĕō*, I excite: It. *sollecitare*]: to ask with some degree of earnestness; to entreat; to invite, as the attention; to try to obtain; to summon; to excite; in *OE.*, to disturb; to disquiet. **SOLIC'ITING**, imp. **SOLIC'ITED**, pp. **SOLIC'ITANT**, n. *-ānt*, one who solicits. **SOLIC'ITA'TION**, n. *-ĭ-tā'shŭn*, urgent or earnest request; entreaty; importunity; invitation. **SOLIC'ITOR**, n. *-tēr*, one who asks with earnestness; one who solicits for another; in *Engl.*, one legally qualified to act for another in courts of law; in *Scot.*, an attorney; in *Amer.*, a counsel who acts as attorney (see ATTORNEYS: LAWYER). **SOLIC'ITORSHIP**, n. office or rank of a solicitor. **SOLIC'ITOR-GENERAL**, in the *U. S. federal govt.*, an officer of the dept. of justice. He assists the attorney-gen.—In *England*, the solicitor-general has powers similar to those of the atty.gen. (see under ATTORNEY), whom he aids in his functions: he is in dignity the second law officer of the crown. **SOLIC'ITOUS**, a. *-tŭs*, careful; apprehensive; uneasy; anxious; eager; very desirous, as to obtain something. **SOLIC'ITOUSLY**, ad. *-lĭ*. **SOLIC'ITUDE**, n. *-tūd*, uneasiness of mind; care; trouble; concern; anxiety.—**SYN.** of 'solicit': to ask; request; beseech; supplicate; entreat; implore; adjure; crave; beg; importune.

SOLIC'ITOR OF THE TREASURY: in the *U. S. federal govt.*, an officer exercising functions in the treasury dept. under the supervision and control of the attorney-gen.: he takes cognizance of infringements of the revenue laws, and is the legal adviser of the sec. of the treasury.—In *England*, the 'Solicitor to the Treasury' acts as attorney for the govt. in all legal proceedings.—In the *U. S. federal govt.* there is also a *Solicitor of Internal Revenue* in the treasury department.

SOLID, a. *sōl'id* [F. *solide*—from L. *solĭdus*, whole, complete, solid: It. *solido*]: hard; firm; compact; impenetrable; not liquid or fluid; not hollow; cubic; healthy; strong; valid; just; not light or superficial: N. a firm compact body; a body not liquid or fluid; in *geom.*, a magnitude having length, breadth, and thickness. **SOL'IDLY**, ad. *-lĭ*. **SOLIDITY**, n. *sō-lĭd'ĭ-tĭ* [F. *solidité*—L. *soliditas* or *soliditātem*]: compactness; density; the quality of bodies which resists impressions; firmness; strength; soundness;

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validity; certitude; weightiness. SOL'IDNESS, n. -nēs, the quality of being firm or dense; moral firmness; soundness; validity; weight. SOLIDIFY, v. sō-līd'ī-fī [F. *solidifier*, to solidify—from L. *solidus*, firm; *faciō*, I make]: to make solid or compact; to grow solid. SOLIDIFYING, imp. SOLIDIFIED, pp. *fid*. SOLIDIFICA'TION, n. -kū'shūn, the state assumed by certain liquid bodies on cooling, or on parting from their heat. THE SOLIDS, as applied to the body, the bones, flesh, etc., as distinguished from the fluids. SOLID ANGLE, an angle made by three or more plane angles meeting in a point, but which are not in the same plane. SOLID MEASURE, a measure in which each of the units is a cube. SOLID SQUARE, a body of troops in the form of a square in which the ranks and files are equal.—SYN. of 'solid, a.': compact; dense; strong; firm; sound; real; true; grave; profound; certain; substantial; hard; valid; just; weighty; important.

SOLIDAGO, n. sōl-ī-dā'gō [L. *solido*, I unite, from the vulnerary qualities which have been attributed to some species]: golden-rod, the typical genus of *Solidagineæ*.

SOLIDARITY, n. sōl'ī-dār'ī-tī [F. *solidarité*, mutual responsibility—from *solide*—from L. *solidus*, solid]: an entire union or consolidation of interests and responsibilities; international stability or strength.

SOLIDUNGULATES, n. plu. sōl'īd-ūng'gū-lāts, or



Foot and Foot-bones of the Horse, showing the Single Toe.

SOL'IDUN'GULA, n. plu. -gū-lā [L. *solidus*, solid; *ungula*, a hoof]: an order of mammals, including the horse and its allies, which have the hoofs whole or undivided: see EQUIDÆ. SOL'IDUN'GULOUS, a. -lūs, or SOL'IDUN'GULAR, a. -lēr, having the hoof entire or not cloven, as in the horse.

SOLIDUS, sōl'ī-dūs [L. 'solid']: Roman gold coin issued first in the reign of Constantine, who substituted it

for the *aureus* of Augustus. The S. weighed about 70 grains, the aureus (originally) about 120 grains. The S., or 'solidus aureus,' was adopted by the Franks under the Merovingians and Carolingians (at 87 to the Roman pound) till the time of Pepin, who suppressed it; but another S. of silver, or 'solidus argenteus'—the $\frac{1}{20}$ of the libra or pound—which had been used only as a money of account, was soon afterward made a coin. In after-times, this 'sol,' or 'sou,' like all other coins, underwent endless variations in fineness and value (see LIVRE). On the introduction of the decimal system (1793) into France, the sou was abolished, and a piece of 5 centimes ($\frac{1}{20}$ of a franc) substituted; but the name continued in common use, and the old sous were retained in circulation. The S. appears also in the *soldo*, a coin in use in n. and central Italy, and essentially the same with the sou.—In Peru, the monetary unit is the sol, a silver coin, in value (1891) \$0.771. In the abbreviation of l. s. d., the s. stands for 'solidus' (plu. *solidi*), solidus thus standing for 'shilling.'

SOLITARY—SOLNHOFEN LITHOGRAPHIC STONE

SOLITARY, a. *söl'î-tér-î* [F. *solitaire*—from L. *solitarius*, solitary—from *solus*, alone: It. *solitario*]: living alone; lonely; remote from society; not much frequented; gloomy; dismal; occurring singly, as a *solitary* instance: N. one who lives alone; a hermit. **SOL'ITARILY**, ad. -*lî*. **SOL'ITARINESS**, n. -*nēs*, state of being alone; retirement; solitude. **SOL'ITAIRE'**, n. -*tär'* [F.]: a hermit; an ornament, set with a single diamond or other gem; game that can be played alone (see above): large extinct bird, like the dodo (see above).—**SYN.** of 'solitary, a.': sole; single; individual; lonely; desolate; remote; retired; gloomy; still; dismal; separate.

SOLITUDE, n. *söl'î-tūd* [F. *solitude*—from L. *solitudo*, loneliness—from *solus*, alone: It. *solitudine*]: loneliness; remoteness from society; retiredness; a lonely place; a desert.

SOLLECITO, ad. *söl-lěch'ē-tō* [It.]: in *mus.*, a direction to perform with care.

SOLLER, *söl-yār'*: town and seaport of the Balearic Isles, in Majorca, 14 m. n. of Palma. It exports oranges and wine. Pop. 7,000.

SOLMIZATION, n. *söl'mî-ză'shăn* [from the vocalizing of the syllables *sol*, *mî*]: act of sol-fa'ing: see **SOLFEGGIO**.

SOLNHOFEN LITHOGRAPHIC STONE, *söln'hof-én*: deposit of limestone of Upper Oolite age, which from its fine-grained and homogeneous texture is admirably adapted for lithographic purposes. It occurs near Solnhofen in Bavaria, and has been extensively quarried. The quarrymen work on the lines of stratification, which are beautifully parallel, and all the fossils are found on the natural surfaces of the beds, and present an impression and cast in almost every instance. The rock is quarried to a depth of 80–90 ft. It is of special interest to the geologist from the singular assemblage of fossil remains preserved in it with wonderful minuteness. The most delicate tracery of the wings of the dragon-fly is often as perfect as in living specimens. The rock is of marine origin, and while lithologically it has a strong* resemblance to the White Lias of Britain, its fossils correlate it to the Kimmeridge Clay. The fossils are chiefly ammonites, nautili, crustacea, winged insects, fishes, and pterodactyles. But the most singular fossil is one discovered 1861: a single feather was first found, and some months later the bones of a feather-covered animal, considered by its first describers a lizard, hence the name first proposed for it, *Gryphosaurus*, i.e., griffin-lizard; but Prof. Owen held it to be a true though very anomalous bird: Huxley makes it the type of the *Saururæ*, the first of his three orders of Birds. The specimen, which is deficient as to head and other important parts, but in other respects is excellently preserved, is now in the Brit. Museum. Prof. Owen named it *Archæopteryx macrura*. It was pronounced the oldest bird of which any remains had yet been found; though the Connecticut valley footprints were supposed to point to a still earlier fowl. These footprints are now by paleontologists



Remains of Archaeopteryx in Solnhofen Stone.



Solomon's Seal (*Polygonatum multiflorum*).



Solen, or Razor-fish (*S. siliqua*).

SOLO—SOLOFRA.

generally attributed to Dinosaurian reptiles. (For the relation of *Archæopteryx* to ancient American birds, see Marsh's *Odontornithes*, monograph on the extinct toothed birds of America.) Another specimen of *Archæopteryx* was found at Solnhofen (1880), and is now in the Royal Museum at Berlin. In this specimen the cervical vertebrae are distinctly seen; the head less distinctly, as also in part the sternal apparatus. In the Brit. Museum specimen (and in the Berlin specimen far more distinctly), at the extremity of each wing is seen a free digit answering to the *pollex*. The *Archæopteryx* was about the size of a rook. The anomalous structure which induced the earlier observers to make it a reptile, and their successors to see in it a transition form between reptile and bird, is the tail, which instead of consisting of a few shortened vertebrae united into a coccygean bone, as in all known birds, recent or fossil, had 20 elongated vertebrae, each supporting a pair of quill-feathers. But this departure from the bird type is not so anomalous as at first appears; for in the early embryonic condition of birds, the vertebrae are distinct and separate, and the anastomosis which invariably takes place in the subsequent development of the embryo, does not occur in *Archæopteryx*, so that it may be considered to exhibit the temporary embryonic condition of the bird as a permanent structure; and that this is the true position of this singular fossil is further evinced by the existence of other features found only in birds. These are the ornithic structure of the wings and legs, the occurrence of feathers, which are confined to birds, and the existence of a merrythought (furcula), found in no other class of animals.

SOLO, n. *sō'lō*, plu. *So'LOS*, *-lōz*, or *So'LI*, *-lē* [It. *solo*—from L. *solus*, alone]: air or strain to be played by a single instrument, or sung by a single voice. The term is used in musical compositions of several parts, vocal or instrumental, to indicate those voices or instruments that are to perform alone or prominently; e.g., *soprano solo*, *violin solo*. The plural, *solī*, is used when two or more voices or instrumental parts are to be performed together, but never doubled.—A composition for a single instrument accompanied also is termed a solo.

SOLOFRA, *sō-lō'frā*: small city of s. Italy, province of Avelino: on the Apennines, surrounded by wooded mountains. It has manufactures of leather, cloth, parchment and jewelry. Pop. (1881) 4,600.

SOLOMON.

SOLOMON, *söl'o-man* (Heb. Shēlômô, Salomon, Salomo, Suleimán; from *shalom*, peace = Man of Peace): about B.C. 1035—about 975 (reigned prob. B.C. 1015–975); second son of David and Bathsheba; successor of David on the throne of the Israelitish empire. There is discrepancy among investigators about these dates—within a range of about 25 years. Nothing is known of his youth except that he was educated probably by Nathan (or Jehiel). Equally uncertain is the age at which he succeeded to the crown of his father. That he was older than 12 or 14 years, as some traditions tell us, seems certain. His succession to the throne during the lifetime of his father was brought about, to the exclusion of his elder brother Adonijah, David's second and eldest living son, by what has been called a *coup d'état* (see I K. i.). But it was made unavoidably sudden by Adonijah's usurpation of the kingly title in David's enfeebled old age, by which act he made void David's own appointment of S., with solemn oath, to be his successor. S., having acceded to the throne, spared Adonijah and the leaders of his faction, until, later, their imprudent action forfeited their lives. Having secured his dominion against internal foes, he, in entire disregard of the Mosaic law, set himself to seek foreign alliances, and married as his principal wife the daughter of Pharaoh, probably of Psusenes (Vaphres?), of the 21st dynasty. Besides her, however, he had a vast number of wives—700 'princesses,' and 300 'concubines'—the greatest part of whom were recruited from heathen nations with whom an alliance had been strictly prohibited. Having inherited fabulous wealth, and further adding to it enormously from his own multifarious revenues, so that 'silver was nothing accounted of in his days,' it became necessary that a new organization corresponding to this unheard-of splendor should be introduced. Accordingly, we hear of 'Princes,' i.e., great officers of state, not before known in Israel. The two counsellors of David's time disappear, probably to make room for a whole body of legal advisers; the prophets are no longer found among the dignitaries of state, but new military charges are created instead. The immense accumulation of treasure also allowed the execution of a number of public works in Jerusalem, which now first assumed the magnificence and station of a capital. A new wall with fortified towers was erected around it; and under the king's immediate orders was built the Queen's Palace—'the House of the Forest of Lebanon'—with a long hall joined to it by a cedar porch, called the 'Tower of David,' outside of which a thousand golden shields were suspended, and within which the king sat, in all his imperial splendor, to pass judgment. His banquets, at which all the vessels were of gold; his stables, with their four (or forty) thousand stalls; his gardens and parks and summer retreats, were such as to dazzle even eastern fancy. Twelve commissaries, distributed in the different provinces, had each in his turn to furnish the means of sustaining this prodigious household. The dominion of S. extended from Thapsacus, on the Euphrates, to Gaza on the Mediterra-

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near. The country was in profound peace; the treasures accumulated by David appeared inexhaustible; and the popularity of the king, who listened to the meanest of his subjects, and gave judgment according to that wisdom for which he had asked in his vision at Gibeon, in preference to any other gift, and which has remained proverbial from his day to ours, was naturally at first very great. Everything, moreover, was done to develop and increase the national wealth and welfare. The rich internal resources were developed, and extensive commercial relations were established.

Through the port established at Ezion-Geber, at the head of the Gulf of Elath, an outlet was gained to the Indian Ocean; and the alliance with Phœnicia, then under the sway of Hiram, King of Tyre, gave an energetic impulse to these foreign expeditions. Manned with Tyrian sailors, the Israelite fleets went to 'Ophir,' and brought back, in exchange for their own exportations, 'gold and silver, apes and peacocks, ivory and spices,' and the rest of the strange and precious produce of India, Africa, Spain, and other regions, possibly even the far British coasts.

According to his promise, S., in the fourth year of his accession, commenced the building of the Temple on Moriah, after the model of the Tabernacle; wherein he was aided by King Hiram, who sent not only timber, but architects and cunning Phœnician artists in wood and stone and metals. In the 11th year of his reign it was completed, and in the 12th year solemnly inaugurated—at which occasion prodigious numbers of sacrifices were slaughtered. Thirteen years more having been spent in the construction of the 'House of the Forest of Lebanon' (the royal palace), other buildings and fortifications—among them that of Palmyra—are recorded to have been undertaken by the king, who, far from wishing further to extend his dominions, was bent only on keeping his frontiers safe from the raids of the neighboring hordes, and for that purpose alone kept up an unprecedentedly large army.

The fame of S. could not but spread far and near. The splendor of his court and reign, heightened by his personal qualities, his wisdom and erudition—for he was famed as not only the wisest but also the most learned of men—brought embassies from all parts to Jerusalem to witness his magnificence and to lay gifts and tribute at his feet. The queen of Sheba's expedition and presents are well known; and as presents or tributes no less splendid were annually made him by many Arab kings, his income from different sources was calculated, in round numbers, at the enormous sum of 666 golden talents. That people of Moses, which was to know no other wealth than flocks and the fruits of the soil, had suddenly become a people of wealthy merchants, of soldiers, and of courtiers—and it did not profit by the change, chiefly through the bad influence of the king himself and his court. The army and the public buildings absorbed the resources of the prov-

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inces. In the Temple, erected for the true worship of Jehovah, the one Living God, S. sacrificed three times a year; nevertheless, to please his concubines, he allowed, and perhaps himself indulged in, the rites of polytheism on various heights; thereby setting the worst example to his subjects, sufficiently eager already to worship the idols of the nations. His exaggerated polygamy fostered immorality and licentiousness among the people; and, worst of all, the wise and gentle monarch, as his treasure became exhausted, began, toward the end of his reign, to lay the yoke, which hitherto had lain only on his Canaanite subjects, upon the Israelites themselves. Thus he became, in fact, an eastern despot—selling part of his dominion to raise money, and trying to break the spirit of the nation by forced services and corporal chastisements.

Left by the ‘prophets,’ probably since his open and revolting infidelity with regard to the national worship of Jehovah, he found his advisers chiefly among insolent young courtiers, who awed even his aged counsellors into silence; and from that time a storm began to gather over the land. The priests were on the side of the malcontents; and a vague talk of a general rising, which actually found utterance by a ‘prophet’ in the very face of S., was heard throughout the country. Ahijah of Shiloh predicted, as Samuel had done to David, the partial dominion to the Ephraimite Jeroboam, who consequently had to flee for his life to Egypt. But notwithstanding these internal mutterings, and the open revolts of one or two subject chiefs, such was the prestige both of David’s and of S.’s name, that the king was allowed to die in peace.

S. has been supposed to be the author of Canticles (q.v.), Ecclesiastes (q.v.), Proverbs (q.v.), besides works on science which are said to be lost. But he is also to be considered the prime cause of the final and decisive downfall of the Jewish commonwealth for all historical times. His wisdom, which turned into folly as his justice into tyranny, kindled a smoldering discontent which only awaited his death to break into open flames of revolt and internal wars. His character presents the lamentable spectacle of genius gone astray; and many have been the discussions among learned theologians as to any hope of his ‘salvation.’ His name and his fame, however, will, notwithstanding the shadows that shroud his latter days, remain immortal; whether we look at the striking picture of him given in Scripture, or to the more gorgeous kaleidoscope of eastern legends revolving round the golden name of Suleiman: the lord and master of all animate and inanimate beings under the sun, the most beautiful, the most wealthy, of all created men, and whose wisdom was as much without limits as were his riches and power.—See for such legendary accounts of S., Weil’s *Biblical Legends*, the *Targums*, the *Koran*, Lane’s *Arabian Nights*, D’Herbelot, Ginsburg, Fürst’s *Perlenschnüre Suleiman-Nameh*, in 70 books, ascribed to a Turkish poet, Firdusi, etc.

SOLOMON—SOLOMON'S SEAL.

SOL'OMON, SONG OF: see SOLOMON: CANTICLES.

SOL'OMON, WISDOM OF: see APOCRYPHA.

SOLOMON-BEN-ISAAC: see RASHI.

SOL'OMON ISLANDS: double chain of islands in the Pacific, stretching more than 600 m. n.w. and s.e., between s. lat. 5°, e. long. 154° 40', and s. lat. 10° 54', e. long. 162° 30'. They are little known; but in the group are at least 7 islands 50–100 m. long and 15–30 m. broad, besides many smaller islands. By an agreement between Germany and England 1886, the n. chain is recognized as within the German, and the s. chain as within the British 'sphere of influence.' All the islands appear of volcanic origin, and on one, Guadalcanal, is an active volcano; on Bougainville, also, an active volcano is said to exist; on others are solfataras and boiling springs. The fauna is Papuan, and the flora shows strong Papuan affinities. The population is in race and language Melanesian, and is mostly in the condition of savages. Of the principal islands, these belong to Germany: Bougainville, Choiseul, Isabel; with Shortland, St. George, Ramos, Macqueen, Tasman, Ongtong Java, Gower, and Carteret; and to England these: Rubiana, Murray, Guadalcanal (or Gera), Malaita, Arossi.

SOLOMON'S SEAL. n. *söl'o-monz sël* (*Polygonatum*): a genus of plants of nat. order *Liliaceæ*, differing from Lily of the Valley (q.v.) chiefly in the cylindrical tubular perianth, and in having the flowers jointed to their flower-stalks. The COMMON S. S. (*P. multiflorum*) is found in woods and copses in many parts of England and Europe. It has a stem about two ft. high, the upper part bearing large, ovate-elliptical, alternate leaves in two rows. The flower-stalks are generally branched; the flowers not large, white, and drooping.—The NARROW-LEAVED S. S. (*P. verticillatum*) is a rare British plant, more frequent on the continent: the leaves are whorled.—The ANGULAR or SWEET-SMELLING S. S. (*P. officinale*), also rare in Britain, more frequent on the continent, resembles the Common S. S., but is smaller, and has greenish, fragrant flowers. The young shoots of *P. officinale* are eaten by the Turks like asparagus. The root is white, fleshy, inodorous, with sweetish, mucilaginous, acrid taste: it contains *Asparagin*. It is a popular application to bruises, to prevent or remove discoloration. A kind of bread has been made of it in times of scarcity. The berries are emetic and purgative.—American species are the SMALLER S. S. (*P. biflorum*), 1–3 ft., the flowers mostly in pairs, and the LARGER S. S. (*P. giganteum*) 3–8 ft., peduncles 2–8-flowered, both common. The False S. S. of a number of species is of a different genus (*Smilacina*), with terminal, not axillary, clusters of flowers. S. S. derives its name from stalk scars on the roots.

SOLON.

SOLON, *sō'lon*: most famous of ancient Greek law-givers: approximately, B.C. 638–559; b. Salamis; of one of the most distinguished families of Attica. His father, Execestides, having seriously impaired his income by improvidence, S., while still young, embarked in trade. At first, however, S. appears as an amatory poet. His earliest appearance in politics was in the contest between Athens and Megara for possession of Salamis. By artifice, S. revived the martial spirit of his countrymen, which had sunk under repeated disasters, obtained command of a body of volunteers, and conquered the island about B.C. (596), in which, with others, he obtained a grant of land. Thenceforth his public career is conspicuously noble and honorable. He figures as a wise and unselfish patriot, seeking earnestly, and not in vain, to compose the distractions, partly social and partly political, that rent the city of Athens. The Athenians generally had thorough confidence in his integrity; and B.C. 504 he was chosen archon or chief magistrate, with permission to act as he saw best for the good of the state. To borrow a phrase from Roman history, he was invested with dictatorial power. The nature and extent of the Solonian legislation has been the subject of much criticism in modern times, and Grote, in particular, has shown that the 'later ancients' (Plutarch and Diogenes Laertius), on whom we are obliged to rely for almost all our information about S., are full of confusions, misapprehensions, and contradictions; and that it became their habit to attribute to the great Athenian all bits of wise legislation whose paternity they could not discover.

To alleviate the wretchedness due to the relations of debtor and creditor, so insupportable as to threaten civil war, S. proposed and carried a notable measure—the *seisachtheia*, or 'disburdening ordinance' [from *seiō*, I shake off, and *achthos*, burden]—for lightening the burden of debt that weighed down the *Thetes* or lower classes. How this was effected is not correctly explained by Plutarch; the most rational solution is given in Grote's *History of Greece* (III.). From redressing the grievances of a class, S. proceeded, at the solicitations of his countrymen, to remodel the constitution; and here, too, the qualities popularly associated with his name shine conspicuously. Abandoning the semi-civilized theory which regards the nobles as alone worthy of citizenship and of the honors of public office in the state, he introduced the timocratic, rather the plutocratic, principle—classifying citizens according to their wealth or property; the effect of which was not to wrest *all* power or dignity from the hands of the *Eupatridæ* or well-born class, but only to give a portion of it to others of lower rank who might be as wealthy, therefore, presumably, as intelligent and with as much at stake. This reform has been compared to that previously effected by Servius Tullius in the constitution of ancient Rome; and there is at least a striking resemblance in method, if not in design: see *ROME*. S. distributed the citizens into four classes: the first embraced all those whose yearly in-

SOLOR ISLANDS.

come reached 500 medimni, the second, those of between 300 and 500 medimni; the third, those of between 200 and 300 medimni; and the fourth, those whose income fell below 200 medimni. The first three classes were liable to *direct* taxation; the fourth not; but all were liable to *indirect* taxation. The *Boule*, or Deliberative Assembly of Four Hundred, seems to have been left by S. the strictly aristocratical body that he found it. But its power was practically limited by a new *ecclesia* [company called out], or assembly of the four classes, whose ratification was necessary to all measures originating in the *Boule*, or 'Upper House.' On the other hand, the *ecclesia* itself could originate nothing: thus the Attic aristocracy and the Attic plebs could mutually check each other's assumptions. The part of S.'s legislation relating to the industrial pursuits of the citizens appears as excellent as the rest, but the number of his special enactments is too great to be enumerated. They embraced almost every subject of social importance; and the best testimony to their value is in the fact that, when Peisistratos violently overthrew the political constitution established by his kinsman, he allowed his social legislation to stand: see PEISISTRATOS.

The story of S.'s leaving Athens for ten years after his labors as a lawgiver, and travelling into foreign countries, probably is historical, but its details are untrustworthy: in particular, the famous incident of his interview with Cræsus does not suit the requirements of chronology, and must be dismissed as a myth. During his absence, the old dissensions among the Athenians broke out; and when he returned, S. struggled in vain to repress them. A strong hand, as well as a wise head, was needed; and the conspiracy of Peisistratos was quite as much against anarchy as against the constitution. After S.'s defeat, he withdrew into private life, but occasionally assisted with advice his bold, ambitious, and able kinsman, who had so effectively crushed the Athenian 'disorderlies' of all parties.

SOLOR ISLANDS, *so-lor'*: groups of islands e. from Flores in the Philippines, between 122° 56' 30"—124° 25' e. long.; belonging to the Netherlands residency of Timor. Besides several groups of smaller islands, they consist of Solor, 105 sq. m., pop. 15,000; Adanara, 302 sq. m., pop. 36,000; Lomblem, 520 sq. m., pop. 120,000; and Pantar, 275 sq. m., pop. 60,000. Solor and Adanara are separated from Flores by narrow straits; Lomblem and Pantar lie in succession further east.

Solor has little cultivated land, the natives being good sailors, and employed in fishing. Much sulphur and saltpetre are found, from which gunpowder is made. The women weave coarse fabrics for clothing, and exotic cotton has lately been planted with success. Edible nests are extensively collected. In all the villages on the coast, markets are statedly held and numerous frequented. The natives near the sea are Malays, friendly to the Dutch; a few of them Christians, the others Mohammedans. Those of the interior are Alfoors, wild and warlike, who use

SOLOTHURN—SOLUS.

shield and bow, sword and firearms. Adanara is governed by an independent rajah. It is a lovely island, with hills and dales, picturesque villages, and cultivated fields. The people are Malays, partly Mohammedans, partly Rom. Catholics. Lomblem also is beautiful, the natives Malays; those of Pantar are Papuans.

The S. I. are mountainous; the volcano Lobetolle, in Lomblem, is 4,914 ft. high; and the mountains of Pantar, 3,332. They are clothed to their summits with forests. They are governed by the military commander at Laran-tooka, in e. Flores; a Dutch postholder being stationed at Lawajang, the chief place of Solor.

SO'LOTHURN: see SOLEURE.

SOLSTICE, n. *sōl'stīs* [F. *solstice*—from L. *solstitium*, a standing still of the sun—from *sol*, the sun; *sisto*, I make to stand]: that point in the ecliptic at which the sun is furthest from the equator, consequently at the turning-point of its apparent course. There are two such points in the ecliptic—one where it touches the tropic of Cancer, the other where it touches that of Capricorn: the former is the summer, the latter the winter S. to those who inhabit northern latitudes, and *vice versâ*.—The term is used also to signify the *time* at which the sun attains these two points in its apparent course—about June 22 and about Dec. 22. SOLSTITIAL, a. *sōl-stīsh'āl*, pert. to or happening at a solstice, usually the summer one. SOLSTITIAL POINTS, the furthest n. and s. points of the ecliptic at which the sun arrives—the n. being called Cancer, the s. Capricorn. SOLSTITIAL COLURE, the hour-circle which passes through the solstitial points.

SOLT, *sōlt*: town of Hungary, 48 m. s. of Pesth, on a branch of the Danube. Pop. (1880) 5,692.

SOLUBLE, a. *sōl'ū-bl* [F. *soluble*—from L. *solu'bīlis*, soluble—from *solvo*, I loose, I dissolve; *solutus*, loosed: It. *solubile*]: that may be dissolved in a fluid; capable of solution. SOL'UBLENESS, n. *-nēs*, or SOL'UBIL'ITY, n. *-bīl'ī-tī*, the quality of being able to be dissolved in a fluid; in *bot.*, the property of separating into distinct portions by a kind of spurious articulation. SOLUTION, n. *sō-lō'shūn* [F.—L.]: act of dissolving by means of a fluid; a liquid which contains one or more solid substances diffused throughout it (see below): explanation; the explanation or removal of a doubt or difficulty; the worked-out answer to a problem or an equation: in *law*, payment of debts. SOLUTIVE, a. *sōl'ū-tīv*, tending to dissolve; laxative.

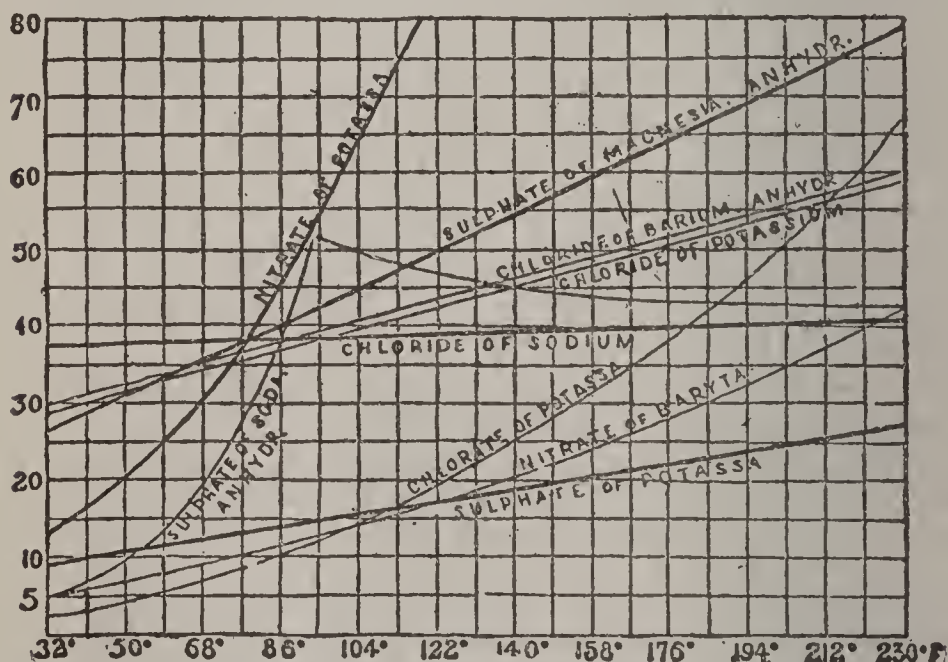
SOL'UBLE GLASS: see GLASS, SOLUBLE.

SOLUM, n. *sō'lūm* [L. *solum*, ground or soil]: in *Scots law*, land; a piece of land.

SOLUS, a. *sō'lūs* [L. *solus*, alone]: alone—used in stage directions.

SOLUTION.

SOLUTION: action that takes place in a substance when the force of adhesion between it and a liquid in which it is immersed is sufficient to overcome the force of cohesion between its solid particles: thus sugar or salt is dissolved by water, camphor or resin by spirit of wine, and silver by mercury. The liquid which effects the S. is termed the *solvent*, or sometimes the *menstruum*; and some solutions have special names—e.g., the term *syrup* is applied to a S. of sugar in water, and *tincture* to a S. of a solid in alcohol. If a solid body be introduced in successive small portions into a definite quantity of a liquid capable of dissolving it, the first portions disappear the most rapidly, and each successive portion dissolves more slowly than its predecessor, until a point is reached at which the liquid ceases to possess further solvent power. When this occurs, the forces of cohesion and adhesion are balanced, and the liquid is said to be *saturated*. S. is promoted by increasing the extent of surface in a solid, or by reducing it to powder. An elevation of temperature, by diminishing cohesion, will generally also increase the solvent



power of the liquid; but there are exceptions—e.g., in the case of lime and its salts—water just above the freezing-point dissolving nearly twice as much lime as when boiling. A compound of lime and sugar, very soluble in cold water, is separated from the S. almost completely, if heated to boiling. But the most remarkable case of the kind occurs in sulphate of soda (Glauber's-salt), which in its crystalline form dissolves in about ten times its weight of ice-cold water, and rapidly becomes more soluble as the temperature rises until it reaches 91° F.; from this point until the S. boils, the solubility slightly decreases, the boiling liquid retaining only about four-fifths of the quantity which was dissolved at 91° F. Carbonate and seleniate of soda, and sulphate of iron, exhibit the same peculiarity in less marked degree. 'These anomalous results may be partly explained,' says Dr. Miller, 'by the consideration

SOLVE—SOLWAY FIRTH.

that heat diminishes the force of adhesion as well as that of cohesion. Generally speaking, cohesion is the more rapidly diminished of the two, although not uniformly so; and in these cases it would appear that the adhesive force decreases in a greater ratio than the cohesion of the saline particles' (W. A. Miller, *Chemical Physics*). The accompanying diagram shows the unequal solubility of various of the more common salts in water of different temperatures. The *lines of solubility* cut the verticals raised from points indicating the temperature on the lower horizontal line, at heights proportional to the quantities of salt dissolved by 100 parts of water: e.g., 100 parts of water dissolve—at 32°, 8 parts, at 122°, 17 parts, at 212°, 26 parts, of sulphate of potash. Water which has been saturated with one substance—that is, which refuses to dissolve any more of that substance—will often continue to dissolve others. In true or simple S., the properties of both the solid and the solvent are retained. When, however, any chemical action ensues between the solid and the liquid, the resulting S. commonly presents perfectly new and distinct features; e.g., when the metals are dissolved by acids, or oils by the alkalies (as in soap-making). For the solubility of the gases in water, see GASES.

The uses of S. in laboratory processes are numerous. By the difference in degree of solubility, we can separate one substance from another; and by dissolving a body, we can purify it either by filtration or crystallization. Moreover, when it is required that two bodies shall react on each other, they do so with incomparably more force in their dissolved than in their solid state.

SOLVE, v. *sōlv* [L. *solvo*, I loose]: to give an explanation of; to clear up; to unfold; to disentangle; to dissipate, as doubts. SOLVING, imp. *sōl'ving*. SOLVED, pp. *sōlv'd*. SOLVER, n. *sōl'ver*, one who solves. SOL'VABLE, a. *-vā-bl* [F.—L.]: that may be solved or explained. SOL'VABLENESS, n. *-bl-nēs*, or SOL'VABILITY, n. *-bīl'ī-tī*, capability of being dissolved; ability to pay all just debts. SOL'VENT, a. *-vēnt*, having the power of loosening or dissolving; able or sufficient to pay all just debts, applied to a person or an estate: N. anything that dissolves another; a fluid in which a solid may be dissolved (see SOLUTION). SOL'VENCY, n. *-vēn-sī*, ability to pay all just debts,—SYN. of 'solve': to unfold; explain; clear up; resolve; disentangle.

SOLWAY FIRTH, *sōl'wā fērth*: in its upper part best regarded as the estuary of the river Esk; in its lower, as an inlet of the Irish Sea: separating n.w. Cumberland from s. Scotland. Its entire length, until lost in the Irish Sea, is calculated at 33 m.; its average breadth for the first 12 m. is not more than 2½ m., but afterward it gradually, though irregularly, increases to more than 20. The principal rivers flowing into it, besides the Esk, are the Annan, Nith, Dee, and Urr, from the n. or Scottish side; and the Eden and Derwent from the s. or English side. The most striking feature of the S. F. is the rapidity with which its tides ebb and flow. The spring-tides are peculiarly swift and strong—the wave rushing in 3 to 6 ft. high, 8 to 10 m. an

SOLYMAN I.

hour, occasionally damaging the shipping; and after its retreat leaving bare great stretches of the bed of the firth, so that in some places one can even cross over from the English to the Scottish shore. The salmon-fisheries of the Solway are valuable.—*Solway Moss* is a dist. of Cumberland about 7 m. in circumference, w. of Longtown, and immediately adjoining Scotland; formerly a bog, but now drained and cultivated. It is historically notable as the scene of a battle between the English and Scots 1542, when the Scots were defeated. Here also, 1771, Nov. 13, an extraordinary disaster occurred: the boggy ground, surcharged with moisture—the effect of heavy rains—rose, swelled, and burst like a torrent, sweeping along with it trees and houses, and destroying about 30 small villages.

SOLYMAN I., *söl'î-man*, Turk. *so-lē-mân'* (or SULEYMAN, *sû-lâ-mân'*), surnamed 'THE MAGNIFICENT': greatest of Turkish sultans: 1490–1566, Sep. 4 (réigned 1520–66); son and successor of Selim I. (q.v.), who had carefully initiated him into the secrets of Ottoman policy. At the commencement of his reign, he restored a large amount of unjustly confiscated property, and removed from office all unfit for their duties. After having suppressed the revolt of the gov. of Syria, he exterminated the Egyptian Mamelukes, and concluded a treaty with Persia. The foolish insolence of the Hungarian court drew him thither with a powerful army, and Belgrade, the key of that country, was captured (1521). He next drove the Knights of St. John from Rhodes (1522); and for three years following gave his efforts to improvement in the administration; but his attempts at military reform provoked a rebellion of the janizaries, which he saw no other means of quelling than by engaging them in a war with Hungary. He gained the signal victory of Mohacz (1526), and, continuing his resistless course, took Buda and Pesth; but he was recalled by the news of a rebellion in the east, and retreated down the Danube to Constantinople, committing frightful ravages on the way. In 1529 he was summoned to Hungary in aid of his protégé, King John Zapolya, who was contesting the crown with Ferdinand; and he accordingly invaded that country with a mighty army, capturing and destroying as he went, and laid siege to Vienna; but after unsuccessful assaults he was compelled to retreat. Two years afterward (1531), he again appeared in Hungary; but his progress this time was checked by Charles V. in person, who had come with the imperial army of 250,000, in aid of his brother. In 1535 he concluded with Francis I. the famous treaty which opened the commerce of the Levant to the French flag alone. In 1540 the long and desultory contest between the Turks and imperialists for Hungary was ended in favor of the Turks, who took complete possession. After this, the alliance between the French and Turks began to bear fruit: the combined fleets ravaged the Italian coasts, and pillaged Nice (1542); but peace was restored with Germany 1547. The Turks were now supreme in the Mediterranean; Gozzo and Tripoli fell into their hands, and the conquest

SOMA.

of the Banat of Temeswar (1551) assured them a firm hold over Hungary. A second and third war with Persia, now in semi-subjugation, the blood-thirsty ambition of S.'s favorite wife Roxolana, who persuaded him to put to death the children of his other wives, a brilliant naval victory (1561) over the Knights of Malta and their allies the Spaniards, an unsuccessful blockade of Valetta in Malta (1565), and a fresh expedition to Hungary (1566), were the chief events of the remainder of his reign. During this last expedition, while besieging the little town of Szigeth or Szegedin, which resisted all his attacks, he died.

SOMA, n. *sō'mā*: Sanskrit name of a plant believed to be the *Asclepias acida*, or Moon-plant; also of an intoxicating drink made from the plant. Its intoxicating and invigorating properties, which the sacrificer experienced when he drank of it in the exercise of his functions, are constantly described or alluded to in the hymns addressed to Soma. Thus, in some hymns, S. is said to exhilarate Varun'a, Mitra, Indra, and the other gods who partake of its juice; and in another the worshippers exclaim: 'We have drunk the Soma; we have become immortal; we have entered into light; we have known the gods. What can an enemy now do to us, or what can the malice of any mortal effect?' In other passages, the juice of the S. is said to be a draught of immortality, medicine for the sick, and a remedy for blindness and lameness. Thus S. became endowed with supernatural qualities and divine attributes—in short, a god. He is the friend, helper, and soul of Indra; he is the slayer of the cloud-demon Vr'itra, the destroyer of foes, the dispeller of darkness, the creator of the sun, the upholder of the sky, and the sustainer of the earth, the king of gods and men; he is thousand-eyed, the most heroic of heroes; he is wise, strong, energetic, etc. See article on S. by John Muir, in 'Contributions to a Knowledge of the Vedic Theogony and Mythology,' *Journal of the Royal Asiatic Society*, new series, I. 135, ff. In the classical period of Hinduism, S. ceases to be worshipped in the character which he had at the Vedic period; he then becomes the god of the moon. This transition from S., the plant and its juice, to S., the moon, is due apparently to the belief that *Amr'ita*, the beverage of immortality, was guarded by the moon. The myths connected with S., the moon, are wholly different from those relating to the Vedic S. As moon, S. was born from the eyes of Atri, a son of Brahman, the first god of the Trimûrti (q.v.); and became installed by Brahman as the sovereign of plants, Brâhman'as, and planets. But after he had acquired extensive dominion, he became arrogant and licentious, and carried off Târâ [lit., a star], wife of Vr'ihaspasi, the preceptor of the gods. Vr'ihaspasi seeking to recover his bride, and some of the gods siding with him, and others with S.—a war broke out, which ended in restoring Târâ to her husband. The result, however, of her stay with S. was the birth of a son named Budha, ancestor of the lunar dynasty of kings. See SŪRYA.

SOMAJ—SOMBRERETE.

SOMAJ, n. *sō-māj*, as in **BRAHMO-SOMAJ** [Hind. *sona* church or assembly]: sect recently sprung up among the natives of Hindustan. **BRAHMO**, *brā-mō*, prefixed, indicates its monotheistic character (see **BRAHMO-SOMAJ**; SEE **KESHUB CHUNDER**).

SOMALILAND, *so-má'lē-land*: maritime country e. Africa, triangular in shape, bounded n. by the Gulf of Aden, s.e. by the Indian Ocean, s.w. by the Jub river. From the middle course of the Jub to Cape Guardafui at the apex of the triangle, is nearly 900 m.; area estimated 330,000 sq. m.; but as great part of its interior unexplored, the number of its inhabitants is unknown. The land is elevated and mountainous in the n., and slopes in terraces toward the s. The Jub, the s.w. boundary, is a large fertilizing stream, drawing its waters from the mountains of s. Abyssinia, and flowing s.e. between the territories of the Gallas on the w. and of the Somali on the e. to its mouth on the n. frontier of Zanzibar. S., in accordance with the Anglo-German agreement of 1890, is within the 'sphere of British influence.' The chief ports on the Gulf of Aden are Zeilah and Berbera. The exports are frankincense, myrrh, hides and horns, ostrich-feathers, superior coffee, indigo, and salt.

The present Somali or Somal race were originally Arab who landed on the African shore s. of the Gulf of Aden early in the 15th c. Driving back the earlier inhabitants who were Christians, the Moslem made themselves masters of the country. They are said to be fierce and lawless; and fanatical Mohammedans.

SOMATIA, n. plu. *sō-mā'shī-ā* [Gr. *sōma*, a body, *sōmāta*, bodies]: the small bodies or particles in the fovilla of protoplasm of pollen-grains.

SOMATIC, a. *sō-māt'ik*, or **SOMAT'ICAL**, a. *-ī-kāl* [Gr. *sōmatikōs*, pertaining to the body—from *sōma*, the body]: belonging to the body. **SOMATIST**, n. *-mā-tīst*, one who admits the existence of corporeal or material beings only; a materialist.

SOMATO-, prefix, *sō-māt-o* [Gr. *sōma*, *sōmatos*, the body]: pertaining to or connected with the body.

SOMATOLOGY, n. *sō'mā-tōl'ō-jī* [Gr. *sōma*, a body, *sōmāta*, bodies; *logos*, a description]: doctrine of organized bodies; also, in general, physics, or the science of material substances (see **MATTER**—also its references: **ATOM**; **ATOMIC THEORY**; **FORCE**, in Physics; also the references); also denoting specially, the science of the human body, as included in Anthropology (q. v.).

SOMBRE, a. *sōm'bēr* [F. *sombre*, dark—from L. *sub*, under; *umbra*, shade or shadow: Sp. *sombra*, a shade]: dark; dusky; gloomy. **SOM'BRENESS**, n. *-nēs*, darkness; gloominess. **SOM'BROUS**, a. *-brūs*, dark; gloomy. **SOM'BROUSLY**, ad. *-lī*. **SOM'BROUSNESS**, n. *-nēs*, state of being sombre: darkness.

SOMBRERETE, *sōm-brā-rā'tā*: town of Mexico, state of Zacatecas, 90 m. n.w. from Zacatecas, in a mountainous district famous for rich silver mines, from which S. derives all its importance. Pop. 14,000.

SOMBRERO—SOMERSET HERALD.

SOMBRERO, n. *sŏm-bră'rō* [Sp. *sombrero*—from *sombra*, shade (see **SOMBRE**)]: a kind of broad-brimmed hat.

SOME, a. *sŭm* [Goth. *sums*, some one: Icel. *sumr*; Dan. *somme*, some: AS. *sum*, some one]: expressing an indeterminate number or quantity, more or less; denoting one person or thing; about, as *some* two dozen; certain; moderate; used improperly for *somewhat*, as, he is *some* better; *some* is used as opposed to *others*: **PRON.** a portion greater or less, as, *some* died. **SOME BODY**, n. *-bŏd-ĭ*, a person unknown or uncertain; a person of consideration. **SOME HOW**, ad. *-how*, in some way not yet known; one way or another. **SOMESUCH**, a. denoting a person or thing of that kind. **SOMETIME**, ad. once; formerly; at a time indefinite. **SOMETIMES**, ad. at intervals; now and then. **SOMETHING**, n. a thing unknown or not specified; a portion more or less; a little: **AD.** in some degree; somewhat. **SOMEWHAT**, n. something, though uncertain what; a part more or less: **AD.** in some degree; to a slight extent. **SOMEWHERE**, ad. in one place or other; in some place. **SOMEWHILE**, ad. once; for a time. **SOMEWHITHER**, ad. to some indeterminate place.

SOMEDEAL, or **SOMEDELE**, ad. *sŭm'dēl* [AS. *sumdæl*—from *dæl*, a part]: in *OE.*, in some degree.

SOMERSAULT, n. *sŭm'ēr-sawlt* [OF. *soubresault*, a somersault—from L. *supra*, above; *saltus*, a leap; *salirē*, to leap]: a leap or spring in which a person turns with the heels thrown over his head, completing a circuit, and again alights on his feet.

SOMERSET, n. *sŭm'ēr-sēt* [F. *soubresault*, a somersault]: a common spelling of **SOMERSAULT**, which see.

SOMERSET, n. *sŭm'ēr-sēt*: a saddle padded before the knee and behind the thigh; originally made for Lord Fitzroy Somerset—from whom it takes its name—who had lost his leg below the knee at the battle of Waterloo.

SOM'ERSET, Earl of (**ROBERT CARR**): about 1590–1645: see **OVERBURY**, Sir **THOMAS**.

SOMERSET, *sŭm'ēr-sēt*, Lady **HENRY**: English philanthropist and reformer: 1851— ————; b. London; maiden name Somers-Cocks; daughter of Earl Somers. In 1872 she was married to Lord Henry S. For a time she was a leader of fashionable society, but after the death of her husband (1884) she retired to her vast estates and devoted herself to the religious instruction of her tenants and neighbors, building chapels, providing missionaries, and holding meetings. Later she became deeply interested in the Woman's Christian Temperance Union of America, and in 1891 attended the first world's convention of the W. C. T. U., at Boston, Mass. In connection with Frances Willard, who became her guest, Lady S. returned to England and advocated the enfranchisement of women, and labor and social-purity reforms, in connection with total abstinence from strong drink.

SOM'ERSET HER'ALD: see **HERALD**.

SOMERSETSHIRE—SOMERS ISLANDS.

SOMERSETSHIRE, *-shér*: maritime county in s.w. England; bounded n.w. by the Bristol Channel, and touching Devon, Dorset, Wilts, and Gloucester; 1,049,815 acres=1,640 sq. m. Pop. (1891) 484,326; (1901) 385,060. Its form is oblong; length about 80 m., and breadth about 36. The surface is extremely diversified, with lofty hills, barren moors, rich vales, and marshy 'levels'—many thousands of acres of the latter being below high-water mark, and depending for security on sea-banks and sluices. The hills are in several ranges running e. and w.: one range, the Mendips (q.v.), runs from near the city of Wells to the coast at Brean-down. South of these hills is a vast marshy plain, on which the Polden Hills stand out abruptly like an island. Another conspicuous group, the Quantocks, rise near Taunton, and attain maximum elevation of 1,270 ft. In the extreme w. is the wild district of Exmoor Forest, composed almost entirely of barren hills—the highest, Dunkery Beacon, 1,668 ft. above the sea-level: this district is often supposed by tourists to be part of Devonshire. The rivers rise chiefly in these high grounds, and are small, except the Bristol Avon, which rises in Wiltshire, and for some miles divides S. from Gloucestershire. The Parret drains the middle districts, and is a tidal stream up to Bridgewater, presenting at spring-tides the phenomenon called the 'bore.' The soil is mostly fertile, and the pasture-lands are almost unrivalled for their luxuriance. The wheat and barley grown around Bridgewater are famous; but grazing and dairy-farming are the great objects of husbandry, and the cheese of Cheddar has wide reputation. Cider is produced in enormous quantities; but the prevalence of small farms keeps agriculture backward. The hilly districts are rich in minerals, especially iron, with some lead and calamine; and the Radstock and Bedminster coal-fields supply the n. districts with excellent fuel. The principal manufactures are woollen cloth, coarse linens, lace, silk, and gloves; but these industries are not progressive, and the pop. in the rural districts is diminishing. Medicinal springs are an important feature of the county, having brought into celebrity and sustained in splendor the city of Bath (q.v.). Weston-super-Mare, containing at the beginning of the 19th c. a few hovels, is now one of the finest watering-places on the west coast.—In ancient times, this part of the kingdom was inhabited by the *Belgæ*, and the Mendips appear to have formed so strong a barrier against the Roman and Saxon, that, even to this day, philologists can trace the strong Celtic element that held its ground here. Old British camps are very numerous on the hills; and extensive remains of stone circles are visible at Stanton Drew near Bristol. In Saxon times, S. was one of the earliest counties to embrace Christianity; and while a church was founded at Wells 704, on the site now occupied by the fine cathedral, a monastery was founded at Glastonbury, which eventually became one of the wealthiest in the kingdom. S. was the principal arena of the rebellion of the Duke of Monmouth, 1685.

SOMERS ISLANDS: see **BERMUDAS**.

SOMERSWORTH—SOMERVILLE.

SOMERSWORTH: township of Strafford co., s.e. N. H., including the village of Great Falls. It is on the Salmon Falls river, 5 m. n. of Dover, and on the Boston and Maine r.r. Great Falls is an important cotton-manufacturing village, whose factories employ 3,000 persons, containing also woolen mills, shoe factories, etc.—Pop. of S. (1890) 6,207; (1900) 7,023.

SOMERVILLE, *sŭm'ér-vīl*: city in Middlesex co., Mass.; on the Mystic river, and the Boston and Maine and the Fitchburg railroads; 2 m. n.w. of Boston; 4 sq. m. It was cut off from Charlestown 1842, received a city charter 1872, and for many years has been a favorite place of residence for business men of Boston. It is divided into 4 wards; is built on a number of hills, the highest of which are Spring, Central, and Winter; is lighted with gas and electricity; has 4 lines of street railroads; and contains 28 churches, 23 public schools of all grades, public library, 1 savings bank, and 3 weekly newspapers. In 1880 it had \$1,682,795 invested in manufactures, which employed 1,296 hands, and yielded \$5,852,535 products. The chief industrial establishments, 1900, num. 378; employed \$10,131,596 cap. and yielded prod. val. at \$21,776,511. The industries include manufacture of steam-boilers, glass, earthenware, iron-foundry products, bricks, carriages, brass and copper tubing, and curried leather. Banking is done chiefly in Boston. In 1903 the net public debt was \$1,477,000; valuation of real prop. \$55,-445,370; personal \$5,787,870; tax-rate \$1.64 on \$100. There were 2 weekly newspapers and 1 sav. bank. Pop. (1880) 24,933; (1890) 40,117; (1900) 61,643.

SOMERVILLE, *sŭm'ér-vīl*, **MARY**: famed for mastery of mathematics and physical science: 1780, Dec. 26—1872, Nov. 28; b. in the manse of Jedburgh; daughter of Admiral Sir William George Fairfax. She was brought up at Burntisland, and her mother taught her to read; but besides this, she had no education till she was nine years old. At the age of ten, she had a year more of schooling at Musselburgh; and returning home showed great taste for reading. After the age of 13, she twice had, during sojourn in Edinburgh, an opportunity of attending classes, studying music, drawing, and a little Latin, and of entering Edinburgh society. In an algebraic sum in a magazine of fashions, Mrs. S. made her first acquaintance with the subject that most engrossed her attention in after-life. In 1804 she married her cousin, Capt. Greig, of the Russian navy, Russian consul in London; and removed to London. Capt. Greig died 1808, leaving her with two children. She bought books and pursued her studies. In 1812 she married another cousin, Dr. William Somerville, who warmly encouraged her in study. They removed to London 1816, where Mrs. S. went much into society, and became noted for scientific attainments. Visiting the continent with her husband, she made the acquaintance of many scientific men. Laplace spoke of her as the only woman who understood his works. In 1823 Mrs. S. was invited by Lord Brougham to try to popularize, for the English public,

SOMITE—SOMNAMBULATE.

Laplace's great work, *Mécanique Céleste*. She published her work *Celestial Mechanism of the Heavens* 1830; and it at once made her famous. Mrs. S. was awarded a royal pension 1835. *The Connection of the Physical Science*, published 1834, has passed through nine editions. Her next work was *Physical Geography* (1848), of which there have been six Eng. editions. *Molecular and Microscopic Science* appeared 1866. Mrs. S. for many years resided in Italy; and died at Naples. An autobiography, edited and supplemented by her daughter, 1873, is of much literary and personal interest.

SOMITE, n. *sō'mīt* [Gr. *sōma*, a body]: a single segment in the body of an articulate animal.

SOMMA, *som'mā*: town of s. Italy, at the n. base of Mt. Vesuvius. Pop. 7,400.

SOMME, *sōm* (anc. *Samara*): river of n. France, rising in the dept. of Aisne and falling into the English Channel. Its entire length is about 125 m., of which one-half is navigable, and its upper part is accompanied by a canal, so that it has great commercial importance, besides supplying valuable water-power. For paleolithic discoveries in the valley of the S, see **ANTHROPOLOGY**.

SOMME: maritime dept. in n. France, s. of Pas-de-Calais, and n.e. of Seine-Inférieure; 2,377 sq. m. (1,522,520 acres). S. is mostly level, and in parts marshy. The dept. produces abundance of corn and fruits; cattle are reared; and there are extensive manufactures of linen, hemp, cotton, wool, mole-skins, velvets, serges, merinos, reps, poplins, ribbons, laces, embroidery, carpets, and woolen hose. There are iron and copper industries, steam-engine and machinery manufactures; and a great lock manufacture. Amiens (q.v.) is the largest town.—Pop. of dept. (1881) 550,837; (1891) 546,495; (1901) 537,848.

SOMNAMBULATE, v. *sōm-năm'bū-lāt* [L. *somnus*, sleep; *ambūlō*, I walk]: to walk in one's sleep; to wander dreamily and listlessly; to dream or wander as a somnambulist. **SOMNAM'BULA'TION**, n. *-bū-lā'shūn*, act of walking in sleep. **SOMNAM'BULIC**, a. *-bū-līk*, pert. to somnambulism; that walks in sleep. **SOMNAM'BULISM**, n. *-bū-līzm*, act or practice of walking in sleep. **SOMNAM'BULIST**, n. *-bū-līst*, sleep-walker. Walking in sleep is the most palpable, but not the most marvellous, characteristic of this condition. The person affected walks, rides, climbs, with the eyes shut or insensible; his movements are precise, cautious, leading him into positions of difficulty and peril, which, if perfectly alive to their real nature, or if acting under the influence of ordinary motives, he would avoid; and yet there appears to be a partial consciousness of surrounding objects, and an adaptation to circumstances. Individuals have, while in this state, performed long journeys on foot or horseback, paying tolls, avoiding obstacles; they have successfully descended into coal mines; they have ascended in safety to the roofs of houses, have climbed rocky cliffs, and successfully robbed eagles' nests, during the night; millers, saddlers, grooms, seamstresses, all have performed their

SOMNAMBULATE.

customary work with exactitude, but without any recollection of their exertions or industry. Notwithstanding the accuracy with which many acts are performed, that particular senses may be dormant is proved by insensibility to loud noises, and by such instances as that of a cook eating cabbage which had been substituted for a salad which he had carefully and artistically prepared. The senses, in relation to the idea or train of ideas present to the mind, appear to be awake, and preternaturally acute. This fact has suggested the hypothesis that certain faculties are wakeful, open to impressions, and actuated by volition; while others, and the mind in general, are plunged in profound sleep and unconsciousness. This may be true, and is in harmony with the opinion that the phenomena are an acted dream or delusion, and that what is seen, heard, or done, is the mere embodiment or repetition of former impressions or impulses, at the time before the mind. This may be illustrated by the case of the student narrated by the abp. of Bordeaux, who composed a sermon and wrote out music while asleep; read them over, made corrections, scratched out lines, substituted others, put in its place a word that had been omitted, and continued to do all this, though a sheet of pasteboard was interposed between the writing and his face; showing that he was copying mental images, and not with the eye.

Somnambulism occurs in the sensitive and excitable, often in conjunction with other nervous affections, and is hereditary; so that it may be regarded as on, if not within, the boundary of disease.

Artificial Somnambulism (or Trance) is an analogous state, produced by 'hypnotization:' see HYPNOTISM: TRANCE. When artificial somnambulism is produced by the method peculiar to hypnotists, the subject's limbs often remain in whatever position may be given to them by the operator; but the subject can also be made to execute whatever movements or acts, or to see whatever objects, or to hear whatever sounds, the operator may suggest: he becomes an automaton in the operator's hands. He drinks of a glass of water, but for him it is wine, or it is an emetic, as the operator may choose to suggest; and it will have the usual effects of wine or of an emetic. A dagger of paper or other innocuous material is put in his hand with the suggestion that it is a real dagger, and with this he is bid to slay a supposed enemy in the company present: the subject will thrust that dagger into the enemy's breast with all the animosity pertaining to an act of vengeance. The order of the hypnotizer may be that the act shall be performed to-morrow or or a week or a month hence: performed it will be without fail if it be not beyond the physical power of the somnambule. In 'hypnotism' the suggestion is conveyed by speech, or gesture, or physical act or sign of some sort given in presence of the subject. But practitioners of what is sometimes called 'animal magnetism' (as distinct from hypnotism) claim the power of mental suggestion—i.e., the power of putting in the 'magnetic' sleep and suggesting

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thoughts and acts to the subject though the operator be miles distant at the time. For a history of 'hypnotism,' see *Hypnotism*, by Fredrik Björnström (New York 1889); for a philosophical account of hypnotic and 'magnetic' phenomena, see *Mental Suggestion*, by Dr. Joseph Ochorowicz (New York 1891).

SOMNAUTH, *som-nawt'*, or **SOMNATH-PUTTEN**, *som-nāt'pūt-tūn'*: ancient decayed town of Guzerat, Hindustan; on the s. w. coast of the peninsula of Kattywar (q. v.), about 33 m. from its s. extremity. S. is fortified by a strong stone wall 9 ft. thick, with 38 towers; contains many mosques, and the ruins of the celebrated Hindu temple of the idol Somnauth. The ruins of the temple are in fair preservation, and give the idea of its having been a gloomy, massive oblong hall 96 ft. by 68 ft., crowned by a magnificent dome, and covered inside and outside with elaborate sculpture and carving illustrative of mythology. The splendor of this temple has doubtless been exaggerated by travellers; but a thousand years ago it was so famous as a place of pilgrimage for pious Hindus, as well as for its immense wealth—accumulation of centuries of gifts—that it attracted the zealous idol-destroyer Mahmud of Ghizni (see **GHIZNEVIDES**), who 1024 appeared before S., captured it, destroyed its great idol, and took as spoil the enormous wealth of its temple, whose beautiful sandal-wood gates were (it was said) brought back from the entrance to Mahmud's tomb in Afghanistan by the British 1842, 8 centuries afterward. They were, however, never restored to S. The repute of S. as a place of religious pilgrimage, and its wealth, revived some time after its spoliation by Sultan Mahmud; and it is still a chief resort of pious Hindus from all quarters.—Pop. (1881) 6,644.—See Price's *Mohammedan History*, II.; Dow's translation of the *Ferishta*; Mirkhond's *Rauzat-al-safa*; Sir John Malcolm's *History of Persia*, I.; Smith's *Life of Dr. John Wilson* (1878).

SOMNIFEROUS, a. *söm-nĩf'ér-ūs* [L. *somnus*, sleep; *fero*, I bring]: causing or inducing sleep; soporific.

SOMNIFIC, a. *söm-nĩf'ík* [L. *somnus*, sleep; *faciō*, I make]: causing sleep; tending to induce sleep.

SOMNILOQUISM, n. *söm-nĩl'ō-kwĩzm* [L. *somnus*, sleep; *loquor*, I speak]: talking in one's sleep. **SOMNIL'OQUIST**, n. *-kwĩst*, one who talks in his sleep. **SOMNIL'OQUOUS**, a. *-kwĩs*, apt to talk in sleep. **SOMNIL'OQUI**, n. *-kwĩ*, a talking in sleep.

SOMNIPATHY, n. *söm-nĩp'ă-thĩ* [L. *somnus*, sleep; Gr. *pathos*, feeling]: sleep from sympathy or some external influence, as from mesmerism. **SOMNIP'ATHIST**, n. *-thĩst*, a person in a state of sleep from sympathy.

SOMNOLENT, a. *söm'nō-lěnt* [F. *somnolent*—from mid. L. *somnūlen'tus*, negligent, drowsy—from L. *somnus*, sleep]: inclined to sleep; drowsy. **SOM'NOLENCE**, n. *-lěns* [F.—L.]: inclination to sleep; also **SOM'NOLENCY**, n. *-lěnsĩ*. **SOM'NOLENTLY**, ad. *-lĩ*.

SON—SONG.

SON, n. *sŭn* [Goth. and Lith. *sunus*; Russ. *suin'*; Dan. *søn*; Sw. *son*; A.S. *sunu*; Ger. *sohn*; Skr. *sūnu*, a son; Fin. *sündua*, to be born]: a male child or male descendant; a term of affection and familiar endearment; an old person's address to a youth, as a priest or teacher to a disciple; a native; the produce of anything, or denoting some quality, as 'son of pride,' 'sons of light.' **THE SON**, the Second Distinction in the Trinity (see **SON OF GOD**, **THE**). **SON-IN-LAW**, n. the husband of a daughter. **SON LESS**, a. *-lēś*, without a son. **SON'SHIP**, n. state of having the relation of a son. **SON OF GOD**, **SON OF MAN**, titles of Jesus Christ. **SONS OF THE PROPHETS**, among the *anc. Jews*, young men under instruction for offices in the church and state, in schools or colleges.

SONANT, a. *sō'nănt* [L. *sonans* or *sonan'tem*, sounding; *sonārē*, to sound]: pertaining to sound; uttered with sound instead of breath alone; vocal.

SONATA, n. *sō-nă'tă* [It. *sonata*, a sonata—from L. *sono*, I sound]: short piece of music intended for an instrument, as *cantata* is for the voice: the name S. is now applied most frequently to a kind of composition for the pianoforte. In general it may be described as a musical composition for a solo instrument, sometimes accompanied by one or two other instruments, and comprising three, four, or even more movements; these movements usually consist of a subject or subjects, given out first in the key of the dominant, and after certain episodes, in which these themes are presented in a great variety of aspect, they are repeated in the key of the tonic. This form is usually adhered to most closely in the first movement of a S., and gives room for display of the inventiveness and musical resources of the composer. The second movement is generally slower and shorter than the rest, and often in the form of a theme with variations. The most important sonatas are for the pianoforte.—A short S. with two, or at most three, movements, less elaborately worked, is called a *Sonatina*.

SON'CHUS: see **SOW THISTLE**.

SONDERSHAUSEN, *sōn'dērz-how-zēn*: chief t. of the principality of Schwarzburg-Sondershausen, pleasantly situated on the Wipper, 36 m. n.w. of Weimar. Pop. (1890) 6,634.

SONG, n. *sŏng* [A.S. *sang*; Dut. *zang*; Dan. and Ger. *sang*, a song; Icel. *sŏngr*, a song; *sangra*, to whine, to murmur]: a short poem intended or fit to be sung; a ballad; a lay; a strain; poetry: the notes of birds (see **SONG OF BIRDS**). The term S. is applied generally to the poetical and musical composition in union, but sometimes to one or other separately. The poem generally turns on some single thought or feeling, and is divided into portions of returning measure. The term S., properly implying an air of a simple kind, is often incorrectly applied to the elaborate *aria* of the opera, or the solemn air of the oratorio. A S. generally implies an air for a single voice—airs for more than one voice being, however, sometimes called part-

SONGHAY—SONG OF BIRDS.

songs. SONG'LESS, a. -*lès*, destitute of the power of song. SONG'STER, n. -*stér*, one who sings, or is skilled in singing; a bird that sings. SONG'STRESS, n. -*strès*, a female singer. OLD SONG, a trifle. SONG OF DEGREES, a name applied to each of the 15 Psalms from the 120th to the 134th, because of their connection with the 'going up' or travelling to Jerusalem.—SYN. of 'song': ballad; sonnet; cantata; carol; canticle; versicle; canzonet; hymn; ditty; verse; poetry; lay; descant; strain.

SONGHAY, *sòn-gā'*: people of negro race in w. Sudan on both banks of the middle Niger (here called the Aribinda or the Gurma). The language of the S. stands isolated, but is spoken also in Timbuktu and in many oases of the w. Sahara. There was formerly a powerful Songhay empire, which embraced Islamism in the 11th c. In the beginning of the 16th c. it extended over Sudan as far as the e. shore of Lake Tchad, but it was overturned by the Moroccans 1592. The S. are now partly independent. Gagho, the ancient capital, was at the time of Barth's journey a mere village.

SONG OF BIRDS: musical cry of some birds. All birds have some voice or cry which they utter, and most of them various notes appropriate to various occasions. The power of producing clear and sweet musical notes is found chiefly in certain families of the order *Insectores*; some of which, e.g., the lark, pour forth their song in the air; but the greater number, like the thrush and nightingale, are perched or sit while they sing. The compass and variety of notes, the power of trilling and shaking, the loudness, clearness, and sweetness of the song, differ much in different species, each of which may be as fully recognized by its song as by its form or plumage. Birds of the same species present notable differences of song in different districts, comparable to the differences of dialect and intonation between the human inhabitants of different regions of the same country. 'The song, for example, of a thrush near London, or in any of the home counties,' writes an English naturalist, 'has little resemblance, except in specific character, to that of the same bird in Devonshire or near Exeter. The same notes, I suppose, will all of them be detected, but they are arranged for the most part into a different tune, and are not sung in the same way. They are given with different values, and the singing is pitched in a different key.'

The singing of birds is chiefly connected with the pairing-time; though some birds sing at other seasons also, during fine weather, and when food is abundant, as if merely to utter their happiness, and, by uttering, to increase it. The singing of many birds is continued with frequency also during the period of incubation, but with some change of character. The male alone sings: female birds have voice also, but cannot warble like their mates. The song of birds is produced not by the larynx proper, but by the *syrinx* or lower larynx, a distinct organ.

There can be no doubt that the singing of the male bird attracts and pleases the female and that he delights in

SONIFEROUS—SONNET.

this exercise. In this respect there is no difference between the birds of most melodious song and those of harsh discordant voice. In them may be seen also an emulation further displaying itself in combats: but questions of rivalry seem in part to be decided among some of the songsters of the groves by mere musical displays. The song of birds is accordingly made to play an important part in the theory of evolution by natural selection. Caged birds evidently often sing from emulation, or, more properly, stimulation.

The imitative powers so remarkable in the mocking-bird and a few other species are possessed by many birds to some extent. Canaries may be taught to sing a complete tune, and even to articulate a few words.

SONIFEROUS, a. *sō-nĭf'ēr-ŭs* [L. *sonus*, sound; *fero*, I bear]: that gives or conveys sound. **SONIFER**, n. *sōn'ĭ-fēr*, acoustic instrument for collecting sound and conveying it to the ear of a partially deaf person.

SONNET, n. *sōn'nĕt* [F. *sonnet*—from It. *sonetto*, a sonnet—from L. *sonus*, sound]: short poem or song usually of 14 decasyllabic lines, having two stanzas of four lines each, and two of three each, arranged and rhymed in a particular order. **SON'NETEER'**, n. *-ēr'* [It. *sonettiere*]: a composer of sonnets or small poems—usually in contempt.—The *Sonnet* expresses one idea, mood, or sentiment, and its lines have a somewhat intricate arrangement of rhymes. It is admittedly one of the most refined and intellectual forms of poetic expression. Every S. should be full and complete, though terse; and be firmly but gracefully rounded off. The oldest extant specimens are those of Vernaccia, of the 12th c., and Peter delle Vigne, in the 13th c.; but the S. received its highest finish at the hands of Dante and Petrarch. Early in the 16th c., Sir Thomas Wyatt and the Earl of Surrey introduced it into English literature; and Sidney, Spenser, Shakespeare, Daniel, Drayton, Drummond, extended its use and scope. In the early Italian models, the first eight lines make two quatrains, and the remaining six, two tercets. The quatrains have two rhymes, usually arranged so that the 1st, 4th, 5th, and 8th lines rhyme, as do the 2d, 3d, 6th, and 7th. In the tercets great liberty is allowed; but there are generally three rhymes, and they are never in couplets. There is no Italian precedent for the freedom taken by the English poets before Milton, including Spenser and Shakespeare, of making the S. simply a poem of three quatrains, with alternate rhymes, and a rhyming couplet (the common 'illegitimate' form). Some writers call a poem of several pairs of rhyming couplets a S.; also there are so-called sonnets of thirteen or fewer lines. Most of Milton's sonnets are a close approach to the true Italian type. Gray, Warton, and Bowles revived this form of poetry, and Wordsworth contributed about 400 sonnets to English literature. Samuel T. Coleridge, his son Hartley Coleridge, Keats, Shelley, Procter, Mrs. Browning, C. (Tennyson) Turner, Sydney Dobell, and D. G. Rossetti, are known as sonnet-writers.—Of Portuguese sonnets Camoens has left nearly

SONNINI DE MANONCOURT—SON OF GOD.

300. See *The Sonnet*, by Tomlinson (1874), and the notes in the collections named below. Anthologies of the S. are numerous: Henderson's *Petrarcha* (1803); Capel Lofft's *Laura*, 5 vols. (1814), in six languages; and collections of English sonnets by Dyce (1833); Lees (1867); Dennis (1873); Main (1880); Waddington (1880-82); Caine (1882).

SONNINI DE MANONCOURT, *so-nē-ně' déh má-nōng kór'*, CHARLES NICOLAS SIGISBERT: French traveller and naturalist: 1751-1812. Besides residing some years at Cayenne, he travelled in Egypt, Greece, the Archipelago, and Asia Minor. He made valuable researches in nat. history, and published several works, the chief being *Voyage dans la Haute et dans la Basse Egypte* (1799), and *Voyage en Grèce et en Turquie* (1801). He died at Paris.

SON OF GOD, THE: in dogmatic theology, the Second Distinction in the Trinity, commonly spoken of as the Second Person of the Trinity. If we examine the use of the name in the Scriptures, we find it to have been applied by the Lord Jesus to himself, as expressing to his disciples the mysterious relationship in which he stood to God.—The phrase was not altogether unknown to the Jews. The plural, 'sons of God,' occurs several times in the Old Test.; in some cases it is applied (tropically) to angels; in others to the children of Israel, who also in their collective capacity as the favored nation are twice called by God his 'son' (Ex. iv. 22, 23; Hos. xi. 1). The use made in the New Test. of the famous passage Ps. ii. 7-12 ('Thou art my Son; this day have I begotten thee,' etc.), is thought by many to constitute conclusive evidence that the spiritually-minded among the ancient people recognized a 'Son of God.' It has been argued, however, that if the Hebrews generally, or even their spiritual leaders, had advanced to the knowledge of the Messiah as the 'Son of God' in any other sense than that he was prophetically filled with the Spirit of God, both the idea and the phrase would have been far more prominent in the religion and literature of Israel. The idea of a 'Son of God' (in the divine sense) does not appear to have rooted itself in the Hebrew mind: hence, we find that the assumption of the title by the Lord Jesus provoked the bitterest opposition from the great majority of his countrymen. They hated him, not because he claimed to be the 'Messiah,' the 'Christ;' on the contrary, they were ready to accept as such any teacher whose words or works might seem to them to justify his claim to the dignity; but when Jesus, having first excited their antagonism by preaching a spiritual religion of holiness and humility, then proceeded to claim to be 'the Son of God,' equal and one with the Father, this claim was held to supply the final proof of blasphemy, and they sought to stone him. It was, in fact, this very assertion of his supreme essential divinity that cost him his life.—See CHRIST, THE: CHRISTOLOGY: JESUS: TRINITY, DOCTRINE OF THE,

SONOMETER—SOOCEY.

SONOMETER, *n.* *sō-nōm'ě-tēr* [L. *sonus*, a sound; Gr. *metron*, a measure]: an instr. consisting of one or more cords or musical strings stretched along a box or table, weighted at one end and fixed at the other, and divided at pleasure by a bridge—used to exhibit the relations between musical notes; an instr. for testing the efficacy of the treatment for the cure of deafness.

SONORA, *sō-nō'ra*: frontier state in n.w. Mexico, bounded n. by the United States, w. by Lower California and the Gulf of California; 76,900 sq. m. Several fine bays indent the coast; lagoons occur near the shore; and in the w. part are several lakes. The great system of the Andes skirts the e. frontier, and throws off branches which occupy much of the surface of the state. In the w., the surface is mostly flat, with fertile soil and warm but variable climate. The chief rivers are the Rio Colorado, Sonora, Yaqui, and Mayo. Two abundant crops are gathered every year from the same land; and the principal crops are wheat, maize, peas, and beans; tobacco, sugar-cane, and cotton also are grown; and there is extensive cattle-rearing. But the wealth of the state is in its mineral treasures, which are considered inexhaustible, especially gold and silver.—Pop. (1890) 134,790; (1900) 220,553.

SONORIFIC, *a.* *sō'nō-rīf'ík* [L. *sonōrus*, sounding; *faciō*, I make]: producing sounds.

SONOROUS, *a.* *sō-nō'rūs* [L. *sonōrus*, sounding, sonorous—from *sonor* or *sonōrem*, sound; *sono*, I sound: It. *sonoro*: F. *sonore*]: yielding a clear sound when struck; being of a clear loud sound; high-sounding; rich and full in sound. **SONO'ROUSLY**, *ad.* *-lī*. **SONO'ROUSNESS**, *n.* *-rūs-nēs*, quality of yielding sound when struck; grandeur of sound. See **SOUND**.

SONSONATE, *sōn-sō-nā'tā*: town of Central America, in San Salvador, 40 m. w.n.w. of the city of San Salvador. Pop. about 10,000.

SONSY, or **SONSIE**, *n.* *sōn'sī* [Scot.: Gael. and Ir. *sonas*, prosperity, happiness]: *colloq.*, lucky; fortunate; good-humored; good-looking; fat; pleasant; plump; thriving; in good condition.

SONTAG, *sōn'täg* or *zon'tách*, **HENRIETTA**: vocalist: 1806, Jan. 3—1854, June 17; b. Coblenz, Prussia. She was educated for the stage; and was greatly admired for her personal charm as well as for her musical gifts. After a brilliant operatic career at Vienna, Berlin, Paris, and London, she married Count Rossi 1829, and left the stage 1830. Compelled by pecuniary difficulties to reappear 1849, she achieved renewed success in Europe and America. She died in Mexico.

SOOCEY, *n.* *sō'sī* [native name]: a mixed striped fabric of silk and cotton in India.

SOO-CHOW—SOOT.

SOO-CHOW, or SU-TCHOU, *sô-chow'*, or SOO-CHOW-FOU *f'ou* [*fou* signifying *city*]: large city of China, province of Kiang-su, 60 m. w.n.w. from Shanghai. It is near the Grand canal, which connects Hang-chow with Nanking and Pekin; but its port is Shanghai, with which also it has water-communication. It is about 10 m. in circumference and is inclosed by fortifications, outside of which are four very large suburbs. The country around is level, and remarkable for fertility, so that the Chinese speak of it as a terrestrial paradise. The city has silk manufactures, printing establishments, and large trade in books. In 1857 it was captured and sacked by the Taepings. In 1863 it was invested by the imperialists, under a British officer and the rebel chiefs, having surrendered, were beheaded by the gov. of the province. Pop. 500,000.

SOOLOO' ISLANDS: see SULU ISLANDS.

SOON, ad. *sôn* [Goth. *suns*, immediately; *sunsei*, as soon as: AS. *sóna*, soon: Dut. *saen*, immediately]: in a short time; without delay; early; quickly; before the expected time; promptly; readily; willingly. AS SOON AS, or SO SOON AS, immediately at or after another event. *Note*.—The distinction in use (but not universally recognized) seems to be: AS SOON AS, in affirmative or corresponding sentences—*as soon as* you have done your lessons you may go: *so soon as*, in negative or adversative sentences—the sun does not rise in winter *so soon as* it does in spring—see Brewer.

SOONAMOOKEE, n. *són'ă-mô-kě'* [Hind., the golden-face]: the state barge of the governor-general of India.

SOON'EE, or SOON'NEE: see SUNNITES.

SOONGA'RIA: see DZUNGARIA.

SOOSOO, *sô'sô* (*Platanista Gangeticus* or *Soosoo Gangeticus*): cetacean of the Dolphin family, inhabiting the Ganges, Brahmaputra, and Indus river systems of India. It is supposed to be the *Platanista* of Pliny. It is the only known existing species of its genus, and is interesting as a fresh-water cetacean. It attains the length of 8 ft., and is not unlike the dolphins in general form. Its habits are sluggish, except that in pursuit of prey it moves with great energy and rapidity. It is quite blind, and feeds on small fish and crustaceans, groping for them with its long snout in the muddy river-beds. The flesh resembles lean beef, but is never eaten by the Hindus, who, however, set a great value on the fat, which lies between the skin and the flesh, as an external medicinal application. There are several fossil species of this genus.

SOOT, n. *sût* [Icel. *sót*; Sw. *sot*; Dan. *sod*; Gael. *suith*, soot]: the portion of fuel escaping combustion, chiefly finely divided carbon: V. to cover or foul with soot. SOOT'ING, imp. SOOT'ED, pp. SOOT'Y, a. -*î*, producing, containing, or resembling soot; foul with soot; dusky; dark. SOOT'ILY, ad. -*î-lî*. SOOT'INESS, n. -*nês*, the quality of being foul with soot.—*Soot* is that portion of fuel which, escaping combustion, is mechanically carried up by the current of hot air, either to be deposited on the sides of the chimney, or to be discharged into the atmos-

SOOTERKIN—SOP.

phere. The S. of coal and that of wood differ materially, the former containing more carbonaceous matter and more ammoniacal salts than the latter. Braconnet published an elaborate analysis of the S. of wood; but good recent analyses of both kinds of S. are still required. Both kinds are used as manure. Wood-soot (*fuligo ligni*) has been (and is still) used in medicine. According to Neligan, it has been found efficacious in later stages of hooping-cough; the tincture, says Dunglison, 'has been recommended as a powerful antispasmodic in hysterical cases;' an ointment of S. has been employed in various cutaneous diseases. Contact with S. often gives rise to a peculiar form of cancer, known as *Chimney-sweepers' Cancer*.

SOOTERKIN, n. *sút'ér-kĭn* [prov. Ger. *suttern*, to boil gently]: a species of false birth, fabled to have been produced by Dutch women from sitting so much over stoves; a proposal or scheme absurd and impracticable.

SOOTH, a. *sóth* [AS. *sóth*, truth: Icel. *sannr*; Dan. *sand*; Sw. *sann*, true, in accordance with the fact]: in *OE.*, true; faithful: N. truth; reality; in *OE.*, cajolery. SOOTH TO SAY, an asseveration of earnest assurance, as, with truth I now speak.

SOOTHE, v. *sóth* [Goth. *suthjan*, to tickle the ears: AS. *gesóthian*, to flatter: Icel. *suda*, to hum: Ger. *sausen*; Dan. *suse*, to buzz]: the radical meaning is, to lull or calm by a monotonous sound; to please with blandishments or soft words; to calm; to tranquillize; to assuage, as pain; to gratify. SOOTH'ING, imp.: ADJ. flattering; softening. SOOTHED, pp. *sóthd*. SOOTH'INGLY, ad. *-lĭ*. SOOTH'ER, n. *-ér*, one who soothes; in *OE.*, a flatterer.—SYN. of 'soothe': to appease; allay; alleviate; relieve; pacify; mitigate; soften; compose; mollify; tranquillize.

SOOTHSAY, v. *sóth'sā* [Eng. *sooth*, and *say*]: to utter predictions without inspiration; to prophesy. SOOTH'SAY-ING, imp.: N. the foretelling future events without being inspired. SOOTH'SAYER, n. *-ér*, one who undertakes to foretell future events; in *entom.*, any individual of the family *Mantidæ*, from the old belief that these insects would indicate by gestures the road a person who had lost his way should take.

SOOTY: see under Soot.

SOP, n. *söp* [Icel. *soppa*; O.Dut. *soppe*, 'a sop: Sw. *soppa*, broth: Norw. *soppa*, bread and milk; *sabba*, to dabble; *subben*, soaked, wet: Goth. *supon*, to dip bread in sauce, to season]: anything dipped and softened in a liquid and intended to be eaten; anything offered to pacify—so called from the mythological story in which a *sop* is said to have been thrown to Cerberus to appease him: V. to steep or dip in a liquid for food. SOP'PING, imp. SOPPED, pp. *sópt*. SOP'PER, n. *-pér*, one who dips something in liquor that is to be eaten. SOP'PY, a. *-pĭ*, soaked or saturated with liquid. SOPS IN WINE, a popular name for the flower called pink. SOP IN THE PAN, a piece of bread soaked in the gravy of the dripping-pan; a tit-bit; a bribe.

SOPH—SOPHISTS.

SOPH, n. *sŏf* [contr. from **SOPHISTER** (q.v., under **SOPHISM**): Gr. *sophos*, wise, clever]: a student who has been two or three years at one of certain universities.

SOPHI, n. *sŏ'fĭ* [Pers. *sŏfi*]: a title of the king of Persia.

SOPHI'A: capital of Bulgaria: see **SOFIA**.

SOPHI'A, St.: see **St. SOPHIA**.

SOPHI'A DOROTHE'A, Princess of Ahlden: see **GEORGE I.**, King of Great Britain.

SOPHISM, n. *sŏf'izm* [F. *sophisme*, a sophism—from L. and Gr. *sophisma*, a device, a quibble, a fallacy—from Gr. *sophos*, wise, clever]: a specious but fallacious argument; a fallacy or subtlety in reasoning. **SOPH'IST**, n. *-ĭst*, one of a body of men who arose in Greece, B.C. 5th c., and taught eloquence, philosophy, and politics, but who, by the use of vain subtleties and false axioms, incurred distrust and contempt (see **SOPHISTS**); a captious or fallacious reasoner. **SOPHISTIC**, a. *sŏ-fis'tik*, or **SOPHIS'TICAL**, a. *-tĭ-kāl*, deceitful or unsound in argument; fallaciously subtle. **SOPHIS'TICALLY**, ad. *-lĭ*. **SOPHIS'TICATE**, v. *-tĭ-kāt*, to adulterate; to debase; to corrupt by something spurious or foreign; to pervert. **SOPHIS'TICATING**, imp. **SOPHIS'TICATED**, pp.: **ADJ.**, also **SOPHIS'TICATE**, a. not pure or genuine: adulterated. **SOPHIS'TICATOR**, n. *-kā-tēr*, one who sophisticates. **SOPHIS'TICA'TION**, n. *-shŭn*, adulteration; admixture; matter added. **SOPHISTER**, n. *sŏf'is-tēr* [usually **SOPH** (q.v.)]: in the *universities of Cambridge, Oxford, and Dublin*, a student during his second and third years; in *OE.*, a disputant, subtle but fallacious; an insidious logician; a professor of philosophy; a sophist. **SOPH'ISTRY**, n. *-trĭ*, specious but fallacious reasoning; reasoning sound in appearance only.—**SYN.** of 'sophisticate, v.': to debase; adulterate; counterfeit;—of 'sophisticate, a.': spurious; supposititious; fictitious; corrupted; vitiated.

SOPHISTS, *sŏf'ists*: chief public teachers in ancient Greece, B.C. 5th and 4th c.; whose character has been a subject of much dispute. Most of the historians of philosophy—influenced seemingly by the lampoons of Aristophanes, the comic poet, and by the disparaging remarks of Socrates, Plato, and Aristotle, who stood in a quite different position from the teachers by profession—represent the Sophists as 'ostentatious impostors, flattering and duping the rich youth for their own personal gain, undermining the morality of Athens, public and private, and encouraging their pupils to unscrupulous ambition and cupidity.' Grote, in *History of Greece*, chap. lxxvii., has combated these positions, and given a much more favorable view, which, even though in parts too favorable, may yet properly modify the common censure.

A Sophist, in the original sense of the word, was a wise man, a clever man, one prominent for intellect or talent. Solon and Pythagoras are called S.; the name was applied even to great poets. Socrates was repeatedly so designated; Plato is alluded to by the same title. By the general public, any man of intellectual eminence would be spoken

SOPHISTS.

of as a Sophist. With the feeling of admiration toward the intellectual class, there was mingled a certain invidious sentiment; and the name Sophist, being often used to express the dislike as well as the admiration, came ultimately to have a predominating bad sense. Still, the general public in the use of the word comprehended Socrates, Plato, and Aristotle, and their philosophical disciples and followers, equally with the distrusted professional teachers.

The great intellectual start in Greece during B.C. 5th c. led to an advanced standard of general instruction. There had been an established popular education long before—including music, reading, and recitation; but now there were found among the public teachers men of the highest accomplishments that the age could furnish, who taught whatever was known of astronomy, geography, and physics, as well as the new controversial discussions in ethics and metaphysics. They were ‘the first professors of the higher education.’ These men shared with the other intellectual celebrities the title Sophist. But there was one circumstance in their case that greatly deepened the invidious sentiment—they taught for pay. This brought them under the odium of two classes: in the first place, the poor felt themselves in a new position of inequality with the rich; secondly, the philosophers, properly so called, who had not yet begun to receive money from their disciples, held themselves superior to those that did. Both Socrates and Plato had vehement repugnance to the idea of a money-bargain between master and pupil; in their eyes, the relationship was one of pure attachment and devotion; and they considered that all the invidious part of the designation Sophist, and more, was deserved by the teachers for hire; and as these public teachers, by the nature of their vocation, would probably be often shallow and superficial as compared with the great philosophers, we can understand the full definition of Sophist by Aristotle—‘an imposturous pretender to knowledge, a man who employs what he knows to be fallacy, for the purpose of deceit and of getting money.’ With all the great authority of Aristotle, this charge applied indiscriminately to the body of men employed in training youth for active life will not stand. Enough is known of the lives, characters, and doctrines of the class to refute such indiscriminate accusation. The S. were a profession growing out of the circumstances, and supplying a want, of the age. The most valuable ideas and habits of any accomplished Athenian were due to his education under some teacher of the class Rhetor or Sophist. So far from the age of the S. being an age of corrupted public morality, Grote contends that it was the reverse: he adduces a multitude of historical facts to prove that the morality of the Athenian public was greatly improved at the end of B.C. 5th c., as compared with its beginning. Still, after conceding to the S. their undeniable merits, their own testimony as to their general method shows it to have had one grand defect—a tendency toward indifference to truth.

SOPHOCLES.

SOPHOCLES, *sŏf'ŏ-klēz*: greatest master of Greek tragedy next to Æschylus: about B.C. 495-406; b. Colonus, a village about a mile from Athens. Sophillus, his father, a man of good birth and fortune, bestowed much care on his son's education; insomuch that, aided by his highly prepossessing appearance, S. was selected for his skill in poetry and music to lead with dance and the lyre, after the victory of Salamis, the chorus of youths in a triumphal pæan composed by himself. In his 28th year he is said to have *exhibited* his first play; and three years before, in a contest with rival scenic writers, one of whom was Æschylus, he gained the first prize, by the decision of the judges Cimon and his colleagues. He had, by Nieostrata, two sons; and one by Theoris, a Sicyonian woman. His private life was easy and contented, but not, as has been hastily assumed, profligate: indeed, his turn of mind was devout, as is evident throughout his plays; and he evinced no taste for political or active life, although he is said to have accepted command in the Samian war, and to have been engaged on foreign embassies. He was a prolific author: he was the reputed composer of as many as 130 plays, of which only seven remain. He gained, according to his biographer, the first tragic prize 20 times, bearing the palm on several occasions from Æschylus and Euripides, and from less-known competitors. He wrote also pæans, elegies, and epigrams, of which we have but few remains. He lived on terms of intimacy not only with his great rivals, but with Aristophanes and Herodotus. We have no knowledge of the order in which his plays that have survived were written: the most plausible arrangement is perhaps that of Müller, who graduates them as follows: *Antigone*, *Electra*, *Trachiniae*, *Œdipus Rex*, *Ajax*, *Philoctetes*, *Œdipus Coloneus*. S. is justly accounted the most perfect of the Attic tragedians. His dramas show the unity in complexity which arises from one central and powerful conception. In his hands, tragedy becomes the true and faithful reflex of human feelings, passions, impulses. His ideas are ethical, with constant reference to a divine disposer of events. 'There has hardly,' says Müller, 'been any poet whose works can be compared with those of Sophocles for the universality and durability of their moral significance. Of all the poets of antiquity, he has penetrated most deeply into the human heart.' So clear and balanced was his style, that in a phrase he often presents vividly an entire character. His versification is remarkable for softness and fluency.—S. has had a multitude of editors. The best editions are those of Wunder (1831-46), Schneidewin, and Campbell (1874-82); with Gottfried Hermann's great critical editions (1823-30). The chief translations of S. into English are those of Potter (Lond. 1788), Dale (Lond. 1824), and Plumptre (1865): besides special translations by Prof. Thompson, of the *Ajax*; by Dr. Donaldson, of the *Antigone*; and by Prof. Campbell, of the *Antigone*, *Electra*, and *Dejanira*.

SOPHOCLES—SOPRANO.

SOPHOCLES, *sŏf'ō-klēz*, **EVANGELINUS APOSTOLIDES**, LL.D.: Greek grammarian: b. near Mt. Pelion, in Thessaly, 1807, Mar. 8. Emigrating to the United States, he became a student in Amherst 1829; then for a time taught school; was tutor in Harvard 1842-59; then he became asst. prof. of Greek there, and (1860) prof. of Greek, anc., Byzantine, and modern. He is author of several grammars and text-books for the use of students of Greek. Among his works are a *Romæ Grammar*; *History of the Greek Alphabet*; *Glossary of Later and Byzantine Greek*; *Greek Lexicon of the Roman and Byzantine Periods*.

SOPHOMORE, n. and a. *sŏf'ō-mŏr* [probably from Gr. *sophisma*, sophism: L. *sophismari*, to argue sophistically; hence may have been formed *sophismator*, and from that *sophimore*, the original spelling of 'sophomore']: in colleges in the United States, a student in the second year class; pertaining to the second-year class; befitting a college student of the second year; immature; inflated. **SOPHOMORIC**, a. *sŏf'ō-mŏr'ik*, befitting a sophomore.—In Eng. universities the term 'Sophister' is used in a like sense.

SOPH'TA: see **SOFTA**.

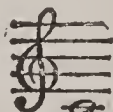
SOPORIFEROUS, a. *sŏ'pŏ-rĭf'ēr-ŭs* [L. *sopor*, a heavy sleep; *fero*, I bring]: tending to produce sleep; narcotic. **SO'PORIF'EROUSLY**, ad. -*lĭ*. **SO'PORIF'EROUSNESS**, n. -*nĕs*, the quality of causing sleep.—**SYN.** of 'soporiferous': somniferous; narcotic; opiate; anodyne.

SOPORIFIC, a. *sŏ'pŏ-rĭf'ĭk* [L. *sopor*, a heavy sleep; *faciō*, I make]: tending to cause sleep: N. a medicine or other substance that has the quality of inducing sleep.

SOPPY, **SOPPED**: see under **Sop**.

SOPRA, n. *sŏ'pră* [It. *sopra*—from L. *supra*, above]: in *music*, the upper or higher part. **SOPRANO**, n. *sŏ-pră'nŏ* [It.]: in *music*, the highest female voice; the treble; plu. **SOPRA'NOS**, -*nŏz*, or **SOPRA'NI**, -*nĕ*. **SOPRA'NIST**, n. -*nĭst*, a treble-singer: see **SOPRANO**.

SOPRA'NO: highest species of human voice—properly

of the female voice; whose range extends from  to



, or in some cases higher. The highest notes gener-

ally belong to the falsetto register. Sweetness and mellowness are the characteristic qualities of a S., which is usually less full than an alto; but lighter, fresher, and more expressive of joyful, lively, and highly impassioned feelings. Music for the S. is written mostly in the treble clef. but sometimes in the soprano clef with C on the first

SORCERER—SORDINE.

members, together with the archdeacon of Paris, the four deans of faculty, and some other dignitaries of the univ. Besides the resident members of the S., there were external associates, 'Socii Hospitalitatis,' who had no share in the governmental acts of the faculty. The S. continued to hold its privileges and its revenues down till the Revolution, when it shared in the common ruin of all the ecclesiastical establishments of France. At the reorganization of the univ. by Napoléon 1808, the S. was re-established as the theological faculty of that body; but it failed to recover its old prestige even with the clergy. One of the conditions of membership was an oath to maintain the celebrated four 'Gallican Propositions;' see GALLICAN CHURCH. This condition deterred many; and though it was revoked by the proposed concordat of 1817, yet, on the failure of this concordat, it continued in force till the revolution of 1830. After various changes, the S. is still an important theological school, with seven professors and a dean. These professors, however, are named by the minister of public instruction; and the absence of control on the part of the bishops over their appointment and their teaching has led to the general withdrawal of clerical students from their lectures; nevertheless, it still possesses at least the permissive sanction of the church. But the S. is now further the seat of two other faculties of the Académie of Paris (i.e., Univ. of Paris: see UNIVERSITY OF FRANCE)—those of letters and sciences; there being 12 chairs in the former faculty, and 7 in the latter. The other two of the five faculties, jurisprudence and medicine, are accommodated elsewhere. All the lectures are open gratuitously to the public (except women); but are attended by few regular students.

SORCERER, n. *sör'sér-ér* [F. *sorcier*, one who divines by casting lots—from mid. L. *sortiārius*, a teller of fortunes by lot—from L. *sors* or *sortem*, a lot, an oracle]: a wizard who divines by the aid of magic or evil spirits; a magician. **SOR'CERESS**, n. fem. *-ēs*. **SOR'CERY**, n. *-ī*, divination by the aid of evil spirits; magic; enchantment.—**SYN.** of 'sorcery, n.': enchantment; magic; witchcraft; conjuration; charms; incantations; spells.

SORD, n. *sawrd*: OE. for **SWARD**, which see.

SORDES, n. *sör'dēz* [L. *sordēs*, dirt]: foul or effete matter; dregs.

SORDET, n. *sör'dēt*: a sordine, which see.

SORDID, a. *sör'dīd* [F. *sordide*—from L. *sordīdus*, dirty, unclean—from L. *sordēs*, dirt, filth: It. *sordido*]: mean; base; vile; meanly avaricious; very niggardly; in *OE*, dirty; filthy. **SOR'DIDLY**, ad. *-lī*. **SOR'DIDNESS**, n. *-nēs*, the state of being sordid; baseness; meanness.—**SYN.** of 'sordid': foul; gross; filthy; dirty; vile; base; covetous; niggardly; avaricious.

SORDINE, n. *sör'dīn* [It. *sordina*, a sordine—from It. *sordo*; F. *sourd*; L. *surdus*, deaf, dull-sounding]: a damper put into the mouth of a horn, or on the bridge of a violin, to muffle or soften the sound.

SORE—SORESINA.

SORE, a. *sōr* [Icel. *sar*, wound, sore: Dut. *zeer*; Icel. *sarr*; A.S. *sár*, painful]: tender to the touch; affected with pain; painful; distressing, as a calamity; much troubled, as the mind; in *OE.*, bad: N. a part in an animal body where the skin is ruptured or bruised; an ulcer; a wound; grief; affliction: V. in *OE.*, to wound; to make sore: AD. intensely; severely. **SORELY**, ad. *sōr'li*, very; very much; exceedingly. **SORE'NESS**, n. *-nēs*, the tenderness of any part of an animal body; trouble of mind. **SOR'ER**, a. in *OE.*, worse. *Note.*—In the sense of 'very, or very much,' **SORE** or **SORELY**, as in '*sorely* distressed, *sore* afraid,' may be compared with Ger. *sehr*, very, exceeding.

SORE, or **SOAR**, n. *sōr* [F. *saur*; It. *sauro*, of a sorrel or brown red color—allied to **SEAR**, which see]: in *OE.*, a hawk of the first year; a buck of the fourth year: see **SOREL**.

SORECIDÆ, *sō-rēs'ī-dē*: family of Mammalia, of the order *Carnaria* and section *Insectivora* of Cuvier. They are generally small animals, covered with soft hair; under which, on each flank, is a band of stiff closely-set bristles, and among them glands which exude a peculiar odorous fluid. The legs are short, and the feet are five-toed, and generally formed for burrowing. Some species are aquatic, and their feet webbed. The S. all are plantigrade. Most of them are nocturnal. They generally feed on insects and worms. A remarkable characteristic of the family is the elongated muzzle. They have long incisors, and their molar teeth are generally furnished with conical points. The tail is generally scaly. To this family belong Shrews, Shrew-mice, Musk Rats or Desmans, etc. They are found both in warm and in cold climates. Those in cold climates usually pass the winter in a lethargic or dormant state.

SOREDIA, n. plu. *sō-rē'dī-ă* [Gr. *sōros*, a heap or pile]: in *bot.*, powdery cells on the surface of the thallus of some lichens.

SOREL, n. *sōr'ēl* [F. *saur*, brownish-red (see **SORE** 2)]: in *OE.*, a buck of the third year.

SOREL, *so-rēl'* (formerly **WILLIAM HENRY**): town, cap. of Richelieu co., Quebec, Canada; on the Richelieu river, at its junction with the St. Lawrence, and on the Grand Trunk railroad; 45 m. n.e. of Montreal. It is an important manufacturing place, producing steam-engines, milling machinery, agricultural implements, leather, bricks, lumber, and flour, and building coasting-vessels; and has a large trade in lumber and with American coast-ports. The town contains an attractive public square; several churches and public schools; Rom. Cath. college, acad., hospital, and convent; and 1 daily, 1 semi-weekly, and 5 weekly newspapers. Pop. (1891) 6,669; (1901) 7,057.

SORESINA, *sō-rā-sē'nā*: mercantile town of n. Italy, province of Cremona. A great trade is carried on in a kind of condiment called *Mostarda* which is prepared there, consisting of fruits, etc., preserved in vinegar and sugar; also in a kind of liqueur called *Mistrà*, in great repute in Italy as a carminative. Pop. 8,553.

SORGHO—SORREL.

SORGHO, n. *sŏr'gō*, and **SOR'CHUM**, n. *-gŭm* [E. Indian name]: see **DURRA**: **SUGAR**.

SORI, n. plu. *sŏ-rĭ* [Gr. *sōros*, a heap or pile]: in *bot.*, the patches of sporangia on the back of the fronds of ferns: see **SORUS**.

SO'RIA: see **NUMANTIA**.

SORITES, n. plu. *sŏ-rĭ'tēz* [L. *soritēs*—from Gr. *sōrei'tēs*, a sorites—from *sōros*, a heap: It. and F. *sorite*]: in *logic*, an abridged form of stating a series of syllogisms, the conclusion of each becoming the premise of the one following.

SORN, v. *sŏrn* [F. *séjourner*, to sojourn, to remain (see **SOJOURN**)]: in *Scot.* and *OE.*, to intrude and live at free quarters in the house of another; to sponge upon. **SORN'ING**, imp.: N. the act of living at free quarters upon another without leave. **SORNED**, pp. *sŏrnd*. **SORNER**, n. *sŏrn'ēr*, one who lives at free quarters in the house of another without leave.

SOROCABA, *sŏ-rŏ-kă'bă*: town of Brazil, province of São Paulo, on the river S., 70 m. w. of the city of São Paulo. Pop. 12,000.

SORORICIDE, n. *sŏ-rŏr'ĭ-sĭd* [L. *soror* or *sorōrem*, a sister; *cædo*, I kill]: the murder or murderer of a sister.

SOROSIS, n. *sŏ-rŏ'sĭs* [Gr. *sōros*, a heap]: in *bot.*, a kind of fleshy fruit formed by the consolidation together of many flowers, seed-vessels, and receptacles, as the pineapple, the bread-fruit, the mulberry, etc.

SOROSIS, *sŏ-rŏ'sĭs*: club for women exclusively, organized in New York 1868, Mar. 18, 'to promote pleasant and useful relations among women of thought and culture, and render them helpful to each other.' The admission fee is \$5; annual dues \$5; and admissions are by ballot. There are 10 standing committees, including those on education, art, science, music, drama, journalism, and philanthropy, which have charge of the details of all social meetings. Social and business meetings are held twice a month, and several special ones each year to which gentlemen are invited. It was founded by Mrs. J. C. Croly ('Jenny June'), its pres. 1868-70 and 1876-86, who was succeeded by Mrs. Ella Dietz Clymer, Jennie M. Lozier, M.D., and Mrs. Wm. Tod Helmuth and (1903) Dr. Lozier. Its membership is of women well known in musical, dramatic, scientific, literary, and philanthropic interests.

SORRAGE, n. *sŏr'ĭj* [etym. doubtful, perhaps from F. *sur*, above]: the blades of green wheat or barley.

SORREL, a. *sŏr'rĕl* [F. *saure*, a yellowish-brown: It. *sauro*, the sorrel color of a horse (see **SORE** 2)]: of an obscure or faint reddish color: N. a sort of yellowish-brown.

SORREL, n. *sŏr'rĕl* [OF. *sorel*, the herb sorrel: F. *sur*; AS. *sŭr*, sour (see **SOUR**)], (*Rumex*): genus of plants of nat. order *Polygonææ* very closely allied to *Polygonum* (q.v.) and *Fagopyrum* (see **BUCKWHEAT**), but having the perianth divided into six segments, the three inner of which enlarge

SORREL TREE--SORRILY.

and cover the *achenium*. The genus is naturally divided into two sections: for the first section, see DOCK.—The name S. belongs only to the second section, characterized by diœious flowers and acidity of stems and leaves. COMMON S. (*R. acetosa*) is a perennial found in meadows and pastures throughout Europe. Its stem is from one to two ft. high; its leaves arrow-shaped. It is an agreeable salad, and is used in soups and sauces, and as an addition to dishes of greens: it is sometimes cultivated in gardens.—FRENCH S., or ROMAN S. (*R. scutatus*), native of France and Italy, has broader and blunter leaves and is more frequently cultivated than Common S., being considered of finer flavor.—SHEEP'S S. (*R. acetosella*), which is our Common S., is a very similar plant, but of much smaller size, and its roots run very much underground, so that it is a troublesome weed in gardens and fields of poor dry soil, in which it is very common.—For WOOD S., see OXALIDÆÆ.—For the RED S. of the W. Indies, see HIBISCUS.—*Salt of Sorrel* is Oxalic Acid (q.v.), so called because contained in the juice of the wood-sorrel.

SORREL TREE (*Oxydendrum arboreum*): tree of nat. order *Ericææ*, remarkable in that portion of the order to which it belongs for its magnitude, its near allies being generally small shrubs. It grows chiefly on the Alleghany Mts., from Penn. to O. and s., and attains a height of 50 ft., with a trunk 12–15 inches in diameter. The wood is of little use. The leaves are acid, and are sometimes used for dyeing wool black. They resemble those of the peach-tree; and the flowers are white, in a long one-sided raceme at the ends of the branches, in early summer.

SORRENTO, *sor-rěn'tō* (L. *Surrentum*, Gr. *Syrentum*): maritime town in s. Italy, province of Naples; on the s.e. side of the beautiful Bay of Naples, on the promontory separating the bay from the Gulf of Salerno; about 7 m. s.w. of Castellamare. It is an archiepiscopal see, and possesses a cathedral. The principal industries are silk culture and silk manufacture, and the inlaying of wood. There are still considerable remains of the walls erected in the middle ages; and on the landward side it is surrounded by a broad and deep ravine, the side toward the sea being protected by precipitous rocks. On the n.w. of the town is a considerable plain or table-land, called *Piano di Sorrento*, about 1,000 ft. above sea-level, surrounded and protected from the cold e. winds by a range of hills; it is intersected by numerous gorges and ravines, studded with villas and farm-houses, and covered with orange groves and vineyards; all which combined render the vicinity of the city highly picturesque. It is celebrated for the mildness, dryness, and general salubrity of its climate, on which account it has been much resorted to in ancient and modern times by invalids and convalescents. Among the Romans, the wine of S. was in high repute: it had to be kept about 25 years before arriving at maturity. Tasso was a native of Sorrento.—Pop. (1881) 6,089.

SORRILY, and SORRINESS: see under SORRY.

SORROW—SORTES BIBLICÆ.

SORROW, n. *sör'rō* [AS. *sorh*; Dut. *zorg*; Dan. and Sw. *sorg*; Goth. *saurga*; Ger. *sorge*; Icel. *sorg*, care, sorrow; Fin. *suru*, grief]: mental pain or uneasiness, caused by some loss or by a disappointment; affliction; grief; regret; in *OE.*, bodily pain: V. to grieve; to feel mental pain; to be sad. **SOR'ROWING**, imp.: **ADJ.** feeling grief or regret: N. the feeling or expression of sorrow. **SOR'ROWED**, pp. *-rōd*. **SOR'ROWFUL**, a. *-fūl*, sad; mournful; grieving for some loss or disappointment; depressed; dejected. **SOR'ROWFULLY**, ad. *-lī*. **SOR'ROWFULNESS**, n. *-nēs*, the state of being sorrowful; grief. **SOR'ROWLESS**, a. *-lēš*, free from sorrow. **SORROW-STRICKEN**, a. exceedingly depressed by grief for some loss.—**SYN.** of 'sorrow, n.': affliction; distress; pain; trouble; grief; sadness; mourning; lamentation; —of 'sorrowful': dismal; disconsolate; dreary; doleful; baleful.

SORRY, a. *sör'rī* [AS. *sárig*, sorry—from *sár*, a wound, a sore: Dut. *zeerig*; OHG. *sērig*, painful, sad—from **SORE** 1, which see: comp. Gael. *saor*, cheap]: grieved for something past; vexed; moderately vexed; afflicted; pained; poor; mean; worthless. **SOR'RILY**, ad. *-rī-lī*. **SOR'RINESS**, n. *-nēs*, the state of being sorry or pitiful; meanness; poorness.—**SYN.** of 'sorry': dismal; grievous; hurt; vexed; chagrined; melancholy; mortified; afflicted. *Note.*—**SORRY** is not the adj. of *sorrow*, with which it has no etymological connection.

SORT, n. *sört* [F. *sorte*, a kind, a species—from L. *sors* or *sortem*, lot, chance, condition: It. *sorta*, sort, species: Dut. *soorte*, a lot]: a kind or species; any number or collection of persons or things more or less resembling each other in qualities or appearance; class; order; rank; degree of any quality; in *OE.*, lot; fate; destiny: V. to reduce to order; to separate into classes; to be joined with others of the same species; in *OE.*, to terminate, to fall out: to choose from a number. **SORTING**, imp.: N. arrangement. **SORTED**, pp. arranged; put in order. **SORT'ER**, n. *-ēr*, one who sorts. **SORT'ABLE**, a. *-ā-bl*, that may be sorted; suitable. **SORTANCE**, n. *sört āns*, in *OE.*, suitability; agreement. **SORTS**, n. plu. varieties. **OUT OF SORTS**, out of order; unwell.—**SYN.** of 'sort, n.': species; kind; class; rank; condition; degree; manner; quality; character; nature; form; genus; order; air; company.

SORTES BIBLICÆ, *sawr't-ēz bīb'lī-sē*—**SORTES VIRGILIANÆ**, *vēr-jī-lī-ā 'nē*—ETC.: modes of divination by means of verses of the Scripture, or of poets, as Virgil, Homer, etc.: the general name of this form of divination is *Stichomancy* [Gr. *stichos*, verse, *manteia*, divination]. The method was to select a number of verses from a poet, mix them together in an urn, draw one out at random, and from its contents to infer good or evil. As Virgil was the most popular and admired of all the Latin poets, his writings, especially the *Æneid*, became a favorite book for this purpose; and undoubtedly this practice laid the basis of Virgil's reputation during the middle ages as a magician. The Sibylline oracles also were much used for the same

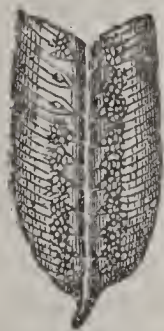
SORTIE—SOTERIOLOGY.

purpose. The practice did not cease with the introduction of Christianity; but instead of Virgil, or, to speak more correctly, together with Virgil, the Bible was thus used to ascertain the future. In place, however, of throwing lines into a 'heathen' urn, it was customary to open the book, as it were accidentally, or to stick a pin between the leaves at hazard, and then open the book—the passage first catching the eye being regarded as pregnant with prophecy of the future welfare. Such lots drawn from Scripture were called, in the middle ages, *Sortes Biblicæ*; as those from Virgil were called *Sortes Virgilianæ*. The custom of using (or abusing) the Bible in this grossly superstitious way still lingers in England, Scotland, and other countries, though more as a frolic of children than aught else. The poet Hafiz is still so used in Persia.

SORTIE, n. *sör'tē* [F. *sortie*, a going out—from *sortir*, to go or come out—probably from L. *surgĕrĕ*, to rise: comp. It. *sorto*, risen; *sorgere*, to rise]: sudden outrush or sally of a beleaguered garrison against their besiegers: see **SALLY-PORT**.

SORTILEGE, n. *sör'tĭ-lĕj* [F. *sortilège*, sorcery—from mid. L. *sortilegiūm*—from L. *sorts* or *sortem*, a lot; *lego*, I choose]: divination by drawing lots. **SORTILE'GIOUS**, a. *-lē'jūs*, pertaining to sortilege.

SORUS, n. *sō'rūs*, plu. **SORI**, *-rĭ* [Gr. *sōros*, a heap]: in bot., a cluster of sporangia in ferns: see **FERNS**.



Frond with
Sori.

SOSS, v. *sōs* [see **SOUSE** 1]: in *OE.*, to fall lazily into a chair; to sit listlessly and lazily: N. a fall; an idler; in *Scot.*, a mess or mixture. **SOS'SING**, imp. **SOSSSED**, pp. *sōst*.

SOSTENUTO, a. ad. *sōs'tĕ-nō'tō* [It. *sustained*]: in *music*, a term denoting that a note or a movement is to be somewhat prolonged or sustained to the utmost of the value of the time.

SOT, n. *sōt* [F. *sot*, dull, gross, sottish: Bret. *sōt*, stupid: Gael. *sotal*, pride, vainglory: Lith. *sotus*; Ger. *satt*, full, satiated]: a person stupefied by excessive drinking; a habitual drunkard; a foolish fellow; a block-head: V. to stupefy; to tittle to stupidity; to besot. **SORTING**, imp. **SORT'ED**, pp. **SORT'ISH**, a. *-tĭsh*, dull; stupid with drink. **SORT'ISHLY**, ad. *-lĭ*. **SORT'ISHNESS**, n. *-nĕs*, the state or quality of being sottish.—**SYN.** of 'sottish': stupid; dull; doltish; senseless; infatuate.

SOTERIOLOGY, *sō-tē-rĭ-ōl'ō-jĭ* [Gr. *sotērios*, pertaining to salvation; *logos*, discourse]: department of Christian dogmatic theology which treats of man's redemption and salvation through Jesus Christ: see **ATONEMENT**.

SOTHERN—SOUBRETTE.

SOTHERN, *sùth'èrn*, EDWARD ASKEW: 1830, Apr. 1—1881, Jan. 20; b. Liverpool: actor. He became an actor at an early age, and, under the name Douglas Stewart, made his first appearance in the United States in Boston as Dr. Pangloss in *The Heir at Law* 1852, Sep. . Till 1858 he played only minor parts; but, Oct. 18, he was cast for the small part of Lord Dundreary in *Our American Cousin*, at Laura Keane's theatre, New York; and, accidentally tripping over some stage properties as he was making his entrance, created so much merriment that he made the tripping a part of his regular performance. His success led him to rewrite and enlarge the part till in time it became the chief in the comedy, and he played it almost continually till his death. S. was successful also as David Garrick in Robertson's comedy of that name, co-operated with that dramatist in composing the comedy of *Home*, and was part author of the comedy of *Trade*.

SOTHIC, a *sòth'ík*: of or pertaining to *Sothis*, the Egyptian name for the dog-star. **SOTHIC YEAR**, the anc. Egyptian year of 365 days, so named from the Sothis or dog-star, at whose heliacal rising it was supposed to commence: also **SOTH' IAC**, a. -*ĩ-ăk*: see **CALENDAR**.

SOTNIA, n. *sòt'nĩ-a* [Rus.]: a company or squadron in a Cossack regiment.

SOTTEVILLE-LÈS-ROUEN, *sèt-vêl'lä-rô-ông'*: town of France, dept. Seine-Inférieure, 4 m. s. of Rouen by railway. The principal industrial products are fabrics of wool and of cotton, chemicals, olive-oil, soaps, and cordage. Pop. (1881) 13,092.

SOTTO, *sòt'tō* [It. *sotto*, under, below, beneath]: in *music*, a term denoting below, or more moderate. **SOTTO VOCE**, -*vò'chā* [It. *voce*, a voice]: with a restrained or moderate voice.

SOU, n. *só*, **SOUS**, n. plu. *sóz* [F. *sou*; OF. *sol*; mid. L. *solidus*, a penny, originally a gold coin: L. *solidus*, solid]: a French coin; one-twentieth of a franc, called sometimes *sol* (see **SOLIDUS**).

SOUA'RI NUT: see **CARYOCAR**.

SOUBAHDAR, n. *só'bă-dâr* [Hind. *subahdar*—from *subah*, a province, and *dâr*, holding]: in *India*, the governor of a province; the chief native commissioned officer in a sepoy company.

SOUBRETTE, n. *sô-brèt'* [F.]: a waiting-maid; on the stage, a woman in a comedy, especially a servant-maid, who acts the part of an intrigante; a meddling, mischievous young woman.

SOUCHET—SOUL.

SOUCHET, n. *sô-shā'* [F.]: the pendulous mucilaginous tubers of *Cyperus esculentus*, cultivated in the s. of Europe, and eaten like nuts. They are sold in the bazaars of Egypt combined with rice in the form of cakes, and, toasted, have been tried as a substitute for coffee. They are nutritive and stimulant; in *cook.*, a dish of Dutch origin in which fish is served in the water or stock in which it is boiled.

SOUCHONG, n. *só'shǒng* [Chin., little sprouts]: a finer sort of black tea.

SOUDAN', or **SOODAN'**: see **SUDAN**.

SOUFFLÉ, n. *súf'lā* [F.—from *souffler*, to puff; *souffle*, breath, blast]: light, delicate dish, chiefly of beaten whites of eggs, to which other ingredients (chocolate, cheese, vanilla, orange-flower water, rose-water, various essences, etc.) are added to give consistency, flavor, and variety. The materials have to be agitated with a whisk un'til the whole is in a creamy froth; which is then baked in a soufflé-pan, made of such a form as to fit into a dish or proper holder, that can be sent to table, and quickly handed round. Usually soufflés are sweet; but savory dishes are prepared in the same way, and bear the same name—e.g., potato-S., omelet-S., etc.

SOUGH, n. *sűf* or *sow* [Icel. *súgr*, a rushing sound: AS. *sweg*, a sighing sound: Scot. *sough* or *souch*, a wailing sound]: a hollow murmuring as of distant waves; a rushing or whistling sound, as of the wind in trees: V. to murmur, as the winds or distant waves; to emit a rushing or whistling sound. **SOUGH'ING**, imp.: **ADJ.** sounding; sighing. **SOUGHED**, pp. *sűft*.—In *Scot*, pronounced *sǒch*, with *ch* guttural.

SOUGH, n. *sűf* [W. *soch*, a drain]: in *OE.*, a small underground drain.

SOUGHT, v. *sawt*: pt. pp. of **SEEK**, which see.

SOUKAR, n. *sow'kér* [Hind. *sahukar*]: a native Indian banker or money-lender. Sometimes called a Marwadi or Marwari, as many native bankers come from the province of Marwar, Rajpootana.

SOUL, n. *sōl* [Goth. *saivala*; AS. *sáwl*; Icel. *sál*; Ger. *seele*, soul: comp. Gael. *saoil*, to think]: the thinking being in man; that part of man which enables him to think and reason, and which originates and is acted upon by the animal passions; heart; vital principle; essence or chief part; internal power; a living intellectual creature; a human being; spirit; energy or grandeur of mind; disposition or appetite; the inspirer of any action, or leader of an enterprise; used as a familiar appellation for a person, as a poor *soul*, a good *soul*. **SOULED**, a. *sōld*, instinct with soul or feeling. **SOUL'LESS**, a. *-lēs*, without soul or life; mean; spiritless. **SOUL-DESTROYING**, a. pernicious; tending to destroy the soul. **SOUL-FELT**, a. deeply felt. **SOUL-DISEASED**, a. in *OE.*, diseased in mind; soul-sick. **SOUL-STIRRING**, a. exciting the deep feelings of the heart. **SOUL-SUBDUING**, a. calming or tempering the deep feeling of the heart.—**SYN.** of 'soul': mind; spirit; intellect; life; courage; ardor; fire; essence; quintessence.

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SOUL: term in spiritualistic philosophy, covering the whole region of mind; generally conceived of as denoting a naturally imperishable entity, in relation with the body, but definable, for the most part, only in terms of the complete negation of material attributes. With this the popular conception in the main coincides, though it is less elaborate and considerably less negative.—While many definitions of the soul may be given, and any definition can be scarcely more than tentative, this may be suggested as perhaps involving much of what is meant by the term soul in ordinary discussions: The whole organic personality of the man in all the faculties and functions of his being, as that personality arises and is developed through the indwelling of his spirit in his body. The spirit is the essential life-principle; the soul is the personal life-organization and life-development, according to the laws that pertain to the human sphere. Similarly, the animal soul is the whole life-development into the individuality of faculties and functions accordant with the laws pertaining to the spiritual essence when working in the animal sphere.

In its original signification, the word appears to have stood for the principle of life both in men and in animals. The modes of conceiving it were various: it was regarded sometimes as the mere harmony of the bodily functions, and sometimes as a distinct entity of highly ethereal nature, and generally supposed to be seated in, or connected with, the blood; but no distinction of essence was made between the soul of man and the soul of brutes. Soon, however, the manifest superiority of man to the lower creation suggested difficulties, which increased as the thought of an after-life, in a different sense from transmigration, was gradually developed. And in man, the constant war with himself, the opposition of passion and reason, as it began to be observed with the growing habit of introspection, called for some explanation which should apply to humanity only. To meet all such difficulties, a 'Trichotomy,' or threefold division of the human constitution, was assumed; according to which a naturally immortal and rational element was supposed to be a part of man, besides the animal soul (always variously conceived) which he shared with the brutes. Between the two distinctive elements—the animal and the rational soul—the various mental energies were differently apportioned by different thinkers, according as those energies were thought more or less noble and divine. Without reverting to obscure traditions of the beliefs of the early peoples, Plato's views may be cited as amounting to a Trichotomy; and in Aristotle there is distinct mention of a poetic principle in man by the side of the animal soul. Later Greek schools put forward a similar view; and Philo, forerunner of the Neo-Platonists, even spoke of *the soul of the soul*. Lucretius has the same curious expression, to which corresponds the distinction of Roman writers in general between *animus* and the animal soul, *anima*. The earliest Christian writings occasionally dis-

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tinguish body, soul, and spirit (*pneuma*). Such a threefold division was unfamiliar to the Jewish mind, which appears to have rested in a kind of Dichotomy or dualism (twofold division); and was removed even from the common Greek philosophical expression, *pneuma* being the word employed by Stoic dualists to describe the fine ethereal nature of the material soul. It is difficult to decide whether a thorough-going Trichotomy was meant by the early Christian writers, or whether in their thought the soul was not merged in either of the extreme elements—the coarse material body, or (as then commonly conceived) the finely attenuated but still material spirit. Till about the 4th c., the language of Trichotomy prevailed in the Christian writings; but thenceforth the doctrine became suspect, having been specially appropriated by certain heretical sects; and soul and spirit came to be identified in substance, and distinguished only in function. Aquinas, and, later, Calvin, pronounced in favor of the dualistic interpretation, after which modern popular expression has been molded, chiefly through the predominant influence of spiritualistic philosophy since the time of Descartes. This gives prominence to the word soul over spirit, except in religious and purely metaphysical aspects. The successors of Descartes have followed him in calling the single soul at once both rational and sensitive. But in rejecting, almost without exception, his description of the lower animals as mere mechanical automata, they have ignored, without attempt to explain, the real difficulty from which he sought riddance, and which the Trichotomy had sought to meet. The ancient doctrine has been revived in various shapes by Paracelsus, Van Helmont, the anatomist Willis, De Maistre, and others. At present the doctrine of the human constitution seems varying between dichotomy and trichotomy, as if disdainful of rigorous classification under either term, though perhaps tending more toward the threefold division. There seems an increasing tendency to avoid a too mechanical division of man into either a twofold or threefold being. On one hand, it is felt to be an inadequate statement concerning man as we see him, and as he knows himself, when it is said of him, either, Man is a body, or, Man is a spirit: for he is something more than either of these. Yet on the other hand, we see him, and he knows himself, as one being. Perhaps the attempt to harmonize these different ranges of facts in man may have occasioned those views of the soul which make it the meeting-point, or rather the organized union, of the human spirit with the human material body—the body being the indispensable ground-plane of reaction for development of the life that is in the spirit, and the soul being the developed result of the balanced action and reaction of the two.

The Egyptian doctrine of the soul is one of the most important, as it is the most ancient; for that nation appears to have been the first to declare the soul immortal. The genesis of the soul itself, however, is not defined by the monuments, though the existence of a cosmic soul, from

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which the others proceeded, is mentioned by ancient authors. The following may be gathered from a comparison of the papyri and monuments with the traditions handed down by the classical writers: The soul itself, when separated, by death of the body, from the cosmic or mundane soul, was supposed to undergo numerous transmigrations, passing from one animated body to another till its cycle of existence was fulfilled. The soul was considered to be essentially distinct from the body, and connected with it through only the link of life. It was represented in the hieroglyphs by several signs, as a basket of fire, a heron, a hawk with a human face, and a ram. Its nature was divine, but after death it passed to the great judgment in the hall of the Two Truths, where it was tried before Osiris and the 42 assessors or demons of the dead, whose verdict determined its future destiny. This depended on the sins that it had perpetrated during life, and which more or less interfered with its transmigration through the necessary cycle of existence till its ultimate union with the deity and reception into the Egyptian heaven. In the judgment, the soul of the wicked was accused by 'the enemy' or accuser; and after the judgment it was devoured or annihilated, or it passed to the region of the Egyptian hell, or to the place of the metempsychosis, from which it entered some body of man or animal just then on the point of entering into existence. The great desire of the dying, indeed, was, that his soul should pass off from the earth, its detention here preventing its ascent to the moon or heaven. The souls of the wicked passed into the Egyptian Hades, which the sun was supposed to traverse during the hours of the night: there they were subjected to punishments corporeal rather than spiritual—burned in braziers, plunged into streams, kept in utter darkness, and deprived of the presence of the Sun-god, uttering fearful wailings in the prisons within which they were confined. After the passing of the great judgment, the soul of the righteous underwent a series of transformations and adventures in the future state. It was justified, as Osiris had been, against the accusations laid to its charge by evil spirits. It assumed the form of a hawk, heron, swallow, and of a snake with a human head—that of the cosmic soul. In the fields of the Aah-en-ru, or Ahln, the Egyptian Elysium, it sowed and reaped the harvest of gigantic grain which grew in that happy plain. It ascended the *makhen*, or mystical bark, and rowed through the winding of the celestial Nile, passed the fiery caldron of the Hades, revisited the body, entered the boat of the Sun, and passed through different regions of the Egyptian hell, in which the damned were detained, arriving at last at the manifestation to light. To preserve the body, in order that the soul might revisit and probably reanimate it at a future period, not only was it embalmed with greatest care, but amulets were attached to it supposed to have the power of retaining the vital warmth, and of protecting it from destruction or decay. The period after which the soul was supposed to enter

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again into a human body was 3,000 years, during which it transmigrated through other orders of animated nature. The principal dogmas, indeed, of the soul among these people were its creation or emanation from the cosmic soul, its transmigrations, and its final reception into heaven, where it lived in the boat of the Sun, and traversed the liquid ether in company with that luminary.—The Pythagorean and Platonic schools seem to have drawn extensively from Egyptian sources in regard to the nature and destiny of the soul. The Brahmanical and Buddhistic notions of the soul also have much in common with the Egyptian. See **BUDDHISM: TRANSMIGRATION**.—On the general subject, see **ANTHROPOLOGY: MAN**; also references under these titles.—Herodot. ii. 23; Plutarch, *De Isid.* c. 29; Hermes, *Clavis*; Prichard, *Egypt. Mythol.*; Rheinisch, *Denkm. in Miramar* (Wien 1865); Tylor's *Primitive Culture* (1871).

SOULE, *sôl*, GIDEON LANE, LL.D.: 1796, July 25—1879, May 28; b Freeport, Me.: educator. He graduated at Bowdoin College 1818, spent a year in Andover Theol. Seminary, was tutor in Phillips Exeter Acad. 1818–9, in Phillips Andover Acad. 1820–1, became prof. of anc. languages in Phillips Exeter Acad. 1822, and held the chair till 1838, when he succeeded Benjamin Abbot, LL.D., as principal. In 1873, after more than 50 years' continuous service in the acad., he was retired as prof. emeritus. He holds a place among the great Amer. teachers in the middle of the 19th century.

SOULE, JOSHUA, D.D.: 1781, Aug. 1—1867, March 6. Meth. Episc. bp. He was licensed to preach 1798, and was presiding elder in Mainë 1804, and subsequently in other districts in that state and Mass., until 1816, when he became editor of the *Methodist Magazine*. After this he had stations in New York and in Baltimore, and was elected bp. 1824. He drafted the plan, at the general conference 1808, for the delegated conference which became a part of the Methodist system. On the secession of the Meth. Episc. Church, South, he removed to Nashville, Tenn.

SOULOUQUE': see **FAUSTINUS I.**

SOULS, CARE OF (Lat. *cura animarum*, care of souls): charge committed to a pastor, of whatever degree of dignity, over the spiritual concerns of a flock—the words implying especially the right of administering the sacraments. In this sense, the phrase is used to mark an important distinction between two classes of benefices or church livings—'benefices with,' and 'benefices without,' the cure of souls. Of the latter class are canonries, prebends, and the whole group known in the canon law as 'simple benefices.' Of the former class are parochial cures, vicarial cures, and still more the higher charges of archbishop, bishop, etc.

SOULT.

SOULT, *sólt*, NICOLAS-JEAN DE DIEU, Duke of Dalmatia, and Marshal of France: 1769, Mar. 29—1851, Nov 26; b. Saint-Amans-la-Bastide, in the dept. of Tarn; son of a notary. In 1785 he enrolled himself as a private in the royal infantry regt.; and so distinguished himself by his steady obedience to discipline, indomitable *sang-froid*, and general intelligence, that 1792 he became adjt. major. His behavior at Fleurus gained for him 1794, Oct. 11, the brevet of gen. of brigade. 1794-99, he was employed on the e. frontier; and in the retreat after the defeat of Stoc-kach 1799, Mar. 25, his able handling of the rear guard alone prevented the annihilation of the French army. Appointed gen. of division 1799, Apr. 21, and put under Massena, whom he ably seconded in Switzerland and Italy, he was afterward, on the warm recommendation of Massena, appointed by Napoleon to one of the four colonel-ships of the consular guards, and now became an ardent Napoleonist. This devotion, doubtless, was a great aid to his obtaining the bâton of Marshal of France; but he most certainly justified his appointment by his brilliant achievements in the subsequent campaign against the Austrians, closed by the battle of Austerlitz, which he decided by piercing the Russian centre. He did good service also in the Prussian campaign; and took an important though not prominent part in the Russian campaign of 1806-7; after which he was appointed gov. of Berlin, and created Duke of Dalmatia. S. was next placed at the head of the second corps in Spain, pursued the retreating British, attacked them at Coruña, and though repulsed, forced them to leave all their matériel behind. He then conquered Portugal, and exercised vice-regal authority over it; but the sudden arrival of Wellesley at Coimbra, and of Beresford at Chaves, caused his rapid retreat to Galicia. 1809, Sep., he became commander-in-chief in Spain, gained a brilliant victory at Ocana (Nov. 18), and at the beginning of the following year overran and subdued Andalusia, continuing to command in person the southern army. In attempting to succor Badajos, which he had captured and garrisoned (Mar. 11), he was defeated by Beresford at Albuera 1811, May 16. After the battle of Salamanca, and the advance of the British on Madrid, S. became thoroughly disgusted at the rejection of his admirable plans for transferring the theatre of war to Andalusia, and demanded and obtained his recall; but on the news of Vitoria (q.v.) reaching Napoleon, S.; whom alone he considered capable of turning the tide of ill-fortune, was, in all haste, restored to the command-in-chief of the army of Spain. Now, however, it was not in Spain but in France that the contest had to be waged; and the advantage of numbers, discipline, and prestige all were on the enemy's side; nevertheless, by a system of military tactics which has been universally admired, S. completely neutralized the consummate strategy of Wellington, and reduced the campaign, during its seven months, to a mere trial of strength—the defeats which he sustained at Orthez and Toulouse being due to the superiority of the British

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soldiers, not of their general. With his usual suppleness of character, he became an ardent royalist after the abdication of Napoleon; but on Napoleon's return from Elba, he abandoned Louis XVIII., and became maj.gen. of the imperial army. After Waterloo, he rallied the army at Laon; and July 2d, at the council of war, coincided with Carnot as to the uselessness of further resistance. To avoid the punishment due to his treachery, he published a memoir traducing Napoleon in the basest manner, and lauding the 'lawful princes' (i.e., the Bourbons); but in spite of this he was banished, and not recalled till 1819, May; however, after a few years he was restored to all his former honors, and became active in politics, and in development of French industry. In 1838 he was sent as ambassador to England; and, as the great antagonist of Wellington, was received with great honor. In 1845 he retired from active duty, was honored with the appointment of 'Marshal-general of France,' and retired to his residence of Soultberg, where he died. In the following year, a statue of S., in white marble, was placed in the galleries of Versailles.—See S.'s *Mémoires*; also, Napier's *History of the Peninsular War*; Thiers's *Histoire de la Révolution et de l'Empire*; Salle's *Vie Politique du Maréchal S.* (1831).

SOUND n. *sound* [F. *son*—from L. *sonus*, sound: W. *son*, noise, report: Bret. *son* or *soun*, sound, tune]: anything perceptible to the ear; that which is audible (see below); noise; report; noise without significance: V. to make a noise: to utter audibly; to play on; to celebrate or extol; to be conveyed in sound. **SOUNDING**, imp.: **ADJ.** sonorous: making a noise: N. the act of one who or that which sounds. **SOUNDED**, pp. **SOUND'LESS**, a. *-lē's*, without sound. **SOUND BOARD**, or **SOUNDING BOARD**, the thin plate of metal or wood which increases the sound of a musical instr.; the structure over a pulpit. **SOUND-BOW**, n. that part of a bell on which the clapper strikes. The sound-bow is the point of the greatest thickness, and is considered as unity in stating the proportions of the bell. **SOUNDING-POST**, or **SOUND-POST**, a small post in a violin or similar instr., set under the bridge for support, and for propagating the sound.

SOUND, n. *sound* [AS. and Icel. *sund*, swimming: Icel. *sund*, a sound or strait: Ger. *sund*, a strait]: narrow passage of water which may be crossed by swimming, or whose depth may be ascertained: a narrow arm of the sea. **SOUNDS** [in Shetland, those of the cod dried for food are called *soums*]: the swimming-bladders of fish. **THE SOUND**, on the n. Atlantic coast, Long Island Sound (q. v.).—In n. Europe, one of the sea-passages or straits leading into the Baltic Sea—the Cattégat, between Sweden on the e. and the Danish island of Seeland on the w. It forms the usual passage from the n. to the Baltic Sea, is 40 m. long, and nearly 3 m. broad at its narrowest part, between the towns of Helsingborg and Elsinore. Its entrance is defended by the strong castle and fortress of Kronborg (see

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ELSINORE). **SOUND DUTIES**, certain dues formerly payable to the Danish govt. by all vessels passing the sound or strait separating Sweden from Seeland. These duties originated in an agreement between the king of Denmark and the Hanse Towns 1348, by which the former undertook to maintain the light-houses in the Cattegat, and the latter to pay duty for them. England became bound to pay duty by a treaty of 1450; other countries followed. The Sound Duties were abolished 1857, Mar. 14, by a treaty between Denmark and other powers. A pecuniary compensation of \$16,480,538 (nearly one-third contributed by Great Britain) was stipulated to be paid to Denmark, which was to be held bound to maintain the light-houses and superintend the pilotage of the Sound.

SOUND, a. *sound* [Sw. and Dan. *sund*; Ger. *gesund*; Dut. *gezond*; L. *sanus*, sound, whole: AS. *sund*, sound]: whole; healthy; not diseased; strong; healthy in mind; unbroken; profound; not defective: heavy, as a beating; not decayed; unhurt; correct; free from error; orthodox; not enfeebled: AD. soundly; heartily. **SOUND'LY**, ad. *-lī*, healthily; heartily; stoutly; smartly; truly; rightly; fast; closely. **SOUND'NESS**, n. *-nēs*, the state of being sound or firm; entireness; strength; solidity; orthodoxy.—**SYN.** of 'sound, a.': healthy; hearty; unhurt; right; orthodox; lusty; stout; strong; valid; fast;—of 'soundness': strength; firmness; solidity; rectitude; truth; sanity.

SOUND, v. *sound* [F. *sonder*, to measure the depth with a plummet—from a supposed L. *subundāre*, to go under water—from L. *sub*, under; *unda*, a wave: perhaps the same word as **SOUND** 2]: to try, as the depth of water and the quality of the bottom, by sinking a plummet attached to a line; to use the line and lead or other means to ascertain the depth of water; to try; to examine; to discover or endeavor to discover, as the thoughts of another: N. in *surg.*, a probe or other instr. used to examine the bladder or a wound. **SOUND'ING**, imp.: N. the act of throwing the lead to try the depth of water, either for purposes of navigation in piloting a ship among shoals or rocks, for ascertaining her position where the depth and nature of the bottom are previously known, or for constructing a chart, etc. It is done generally by means of a marked line, to which is attached a tapered lead, the bottom or foot of the lead being hollowed to receive some grease or tallow to which a portion of the soil at the bottom of the sea will adhere. Other methods have been devised, such as by a rotating fan-wheel, etc.; but the first method is generally used for ordinary depths. See **SOUNDING**, **DEEP-SEA**.—**Sounding** is also the act of endeavoring to discover the opinions of others. **SOUND'ED**, pp. **SOUND'ABLE**, a. *-ābl*, capable of being sounded. **SOUND'INGS**, n. plu. *-īngz*, parts of water where the bottom may be reached; the parts brought up from the bottom to show the nature of the ground. **SOUND'LESS**, a. *-lēz*, unfathomable. **SOUNDING-LINE**, a line used to take soundings. **SOUNDING-ROD**, a rod to ascertain the depth of water in a ship's hold.

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SOUND: impression produced on the Ear (q.v.) by vibrations of the surrounding elastic medium, such as air or water. That this is the case is proved, *first*, by the fact that a bell or tuning-fork *in vacuo* gives no S. when struck; *secondly*, by the fact that mere currents, as such (winds, running water, etc.), do not produce the sensation of S. until they are frittered down into vibratory motions by obstacles.

The most untutored ear distinguishes at once between a mere *noise* and a *musical note*. It of course distinguishes a *loud* S. from a *faint* one. Moreover, it distinguishes musical notes from one another by their shrillness or gravity, or, technically, their *Pitch*. Again, as in the case of vowel-sounds sung to the *same* musical note, or as in the case of different instruments (e.g., flute and violin) playing the same note, the ear distinguishes something further—called the *Timbre* or the *Quality* of the note. It is on the pitch of notes that the Theory of Music (q.v.) is based, for the quality is important only in giving variety—as in orchestral music—or in giving richness of tone in a solo. The most perfect *music*, so far as theory goes, may be executed on the poorest instrument, but it gives little pleasure from lack of richness or quality. In the same way, a singer may possess faultless intonation, yet the performance, though *musically* perfect, may, from the harsh quality of the voice, be unpleasant. Though in this article the intention is to avoid everything connected with music, the above remarks are introduced to show that there is something in the theory of S. more profound than is contemplated in the theory of music.

The questions now to be discussed are:

1. What constitutes the difference between a mere noise and a musical note?
2. On what does the pitch of a note depend?
3. On what does its quality depend?

The answers to these queries all are contained in the following statement:

Every musical note consists in the repetition, at equal minute intervals of time, of some definite noise; the pitch depends on the rate of repetition; and the quality upon the nature of the fundamental noise.

Rough experimental illustrations of the parts of this statement are easily given; more refined ones will be afterward alluded to. If, e.g., the edge of a card be held to a revolving toothed-wheel, a definite sound is produced as each tooth bends the card and allows it to spring back. While the wheel revolves slowly, we can distinguish these successive noises; but when it is revolving so fast that they are no longer separately distinguishable, the character of the S. changes completely. It now becomes continuous, and, so far as the ear can detect, uniform, and thus becomes a musical note (with such an apparatus, not a pleasing one). As the wheel is made to revolve faster and faster, the pitch of the note rises, till it becomes a sort of shriek, and finally becomes inaudible. The *Siren* (q.v.) gives another excellent illustration. In this case the fun-

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damental noise is produced by a puff of air escaping from an orifice; and we observe, just as above, that the greater the number of such puffs per second, after they have become so frequent as to be separately indistinguishable, the higher is the pitch of the musical note produced.

Now, if by machinery we arrange matters so that the siren and the toothed-wheel give the number of puffs and the number of impacts on the card the same per second, the musical note produced by each has the same pitch. But the notes differ greatly in quality, the one being exceedingly soft and pleasant, the other harsh and grating. The pitch, therefore, depends on the number of noises per second, and the quality upon the nature of the fundamental noise. We shall find a complete theoretical proof of this later.

For an account of the mechanical process by which S. is propagated in the air, and a comparison of S. with other cases of wave motion, see WAVE. Meanwhile, it is necessary for us to observe only that, as the velocity of S. is ten times greater than that of wind in the most violent hurricane, it is not *air* itself which is transferred from place to place, but a *state of disturbance* (condensation or rarefaction) of the air. Each successive layer of air in the path of the S. suffers this disturbance in turn, and, by virtue of its Elasticity (q.v.), passes it on to the next.

Newton was the first who attempted to deduce from mechanical principles the velocity of S., but only for the particular case in which each particle of air, in the path of the S., is supposed to move forward and backward, according to the same law as the bob of a Pendulum (q.v.). He showed that this species of motion is consistent with the elastic properties of air, as given by Boyle's or Mariottes' Law (q.v.), viz., that the pressure of air is proportional to its density. The velocity of S. in this case is of course to be found from the time which elapses between the commencement of the motion of any one particle of air, and that of another at a given distance from it, in the direction in which the S. is moving. The numerical result deduced by Newton with the then received experimental data for the compressibility of air, was 979 ft. per second. This investigation was very defective, applying, in fact, solely to the special case of a pure musical note, continually propagated without lateral divergence; yet the solution obtained by Lagrange from a complete analysis of the question gave precisely the same mathematical result.

But, by direct measurements, carefully made, by observing at night the interval which elapses between the flash and the report of a cannon at a known distance, the velocity of S. has been found to be considerably greater—in fact, about 1,090 ft. per second, at the temperature of freezing water.

Newton seeks for the cause of this discrepancy between theory and observation in the idea that the size of the particles of air is finite compared with their mutual distance; and that S. is instantaneously propagated through the particles themselves. Thus, supposing the particles to have a diameter $\frac{1}{2}$ of the distance between them, we must add

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$\frac{1}{2}$ to the space travelled by S. in a second, i.e., to the velocity—which will thus be brought up to $1\frac{1}{2}$ times 979 ft. = 1,088 ft. nearly, a close approximation to the actual value given above.

This is not one of Newton's happiest conjectures—for, independent of the fact that such an assumption would limit definitely the amount of compression which air could undergo, and, besides, is quite inconsistent with the truth of Boyle's law for even moderate pressures, it would result from it that S. should travel slower in rarefied, and quicker in condensed air. Now, experiment shows that the velocity of S. is unaffected by the height of the barometer; indeed, it is easy to see that this ought to be the case. For in condensed air the pressures are increased proportionally to the increase of condensation, and the mass of a given bulk of air is increased in the same proportion. Hence, in a S.-wave in condensed air, the forces and the masses are increased proportionally, and thus the rate of motion is unaltered. But the temperature of the air *has* an effect on S., since we know that the elastic force is increased by heat, even when the density is not diminished; therefore the velocity of S. increases with the temperature at the rate of about $4\frac{1}{2}$ ft. per Fahrenheit degree, as is found by experiment.

Newton's explanation of the discrepancy between theory and experiment being thus set aside, various suggestions were made to account for it; some, among whom was Euler, imagining that the mathematical methods employed, being only approximate, involved a serious error.

The explanation was given finally by Laplace, and is simple and satisfactory. When air is *suddenly* compressed (as it is by the passage of a S.-wave), it is heated; when suddenly rarefied, it is cooled, and this effect is large enough to introduce a serious modification into the mathematical investigations. The effect is in either case to *increase* the forces at work; for, when compressed, and consequently heated, the pressure is greater than that due to the mere compression; and, when rarefied, and consequently cooled, the pressure is diminished by more than the amount due to the mere rarefaction. When this source of error is removed, the mathematical investigation gives a result as nearly agreeing with that of observation as is consistent with the unavoidable errors of all experimental data. It is to be observed that, in noticing this investigation, nothing has been said as to the pitch or quality of the S., for these have nothing to do with the velocity. It must, however, be remarked here that, in the mathematical investigation, the compressions and rarefactions are assumed to be very small; i.e., the S. is supposed to be of moderate intensity. It does not follow, therefore, that very violent sounds have the same velocity as moderate ones, and many curious observations made during thunder-storms seem to show that such violent sounds are propagated with a greatly increased velocity. (See a paper by Earnshaw in the *Phil. Mag.* 1861.) It is recorded that in one of Parry's arctic voyages, during gun-practice, the officer's command

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'Fire' was heard at great distances across the ice *after* the report of the gun. The propagation of S. is not retarded but rather favored by the presence of snow, rain, or fog in the atmosphere; perfect stillness and a uniform temperature and uniform density are also conditions favoring the propagation of S.-waves. A S. is sometimes conveyed better athwart a wind or against a wind than in the same direction with it.

Since S. consists in a wave-propagation, we should expect to find it exhibiting all the ordinary phenomena of Waves (q.v.). Thus, e.g., it is *reflected* (see ECHO) according to the same law as light. It is *refracted* in passing from one medium to another of different density or elasticity: this has been proved by concentrating in a focus the feeble S. of the ticking of a watch, and rendering it audible at a considerable distance, by means of a convex lens of collodion films filled with carbonic acid gas. S. is refracted also by wind: when it has the same direction as the wind, it is refracted earthward; when it takes the opposite direction it is refracted upward: thus a S. inaudible on the deck of a ship to windward of the source of S. may be distinctly audible at the masthead. Difference of temperature is also a cause of refraction of sounds: when the lower atmosphere is warmer S.-waves are tilted up; when it is colder S.-waves are refracted to the earth's surface.

Sounds *interfere* to reinforce each other, or to produce silence; just as the crest of one wave in water may be superposed on the crest of another, or may apparently destroy all motion by filling up its trough. The simplest mode of showing this is to hold near the ear a vibrating tuning-fork and turn it slowly round its axis. In some positions, the sounds from the two branches reinforce, in others they weaken, each other. But if, while the S. is almost inaudible, an obstacle be interposed between the ear and one of the branches, the S. is heard distinctly. Beats, alluded to below, form another excellent instance.

To give an idea of the diminution of loudness or intensity of a S. at a distance from its source, let us consider a series of spherical waves diverging from a point. The *length* of a wave, as we know from the theory, does not alter as it proceeds. (Indeed, as we shall presently see, the pitch of a note depends on the length of the wave; and we know that the pitch is not altered by distance.) Hence, if we consider any one spherical wave, it will increase in radius with the velocity of S., but its thickness will remain unaltered. The same disturbance is thus constantly transferred to masses of air greater and greater in proportion to the *surface* of the spherical wave; therefore the amount in a given bulk (say a cubic inch) of air will be inversely proportional to this surface. But the surfaces of Spheres (q.v.) are as the squares of their radii—hence the disturbance in a given mass of air, i.e., the loudness of the S., is inversely as the square of the distance from the source. This follows at once from the law of conservation of energy (see FORCE), if we neglect the portion which is constantly being frittered down into heat by fluid friction. All sounds.

even in the open air, much more rapidly in rooms, are extinguished ultimately by conversion into an equivalent of heat. Hence sounds really diminish in intensity at a greater rate than that of the inverse square of the distance; though there are cases on record in which sounds have been heard at distances of nearly 200 m. But if, as in speaking-tubes and in speaking-trumpets, S. be prevented from diverging in spherical waves, the intensity is diminished only by fluid friction, and thus the S. is audible at a much greater distance, but of course it is confined mainly to a particular direction.

As already remarked, the purest sounds are those given by a tuning-fork, which (by the laws of the vibration of elastic solids) vibrates according to the same law as a pendulum, and communicates exactly the same mode of vibration to the air. If two precisely similar tuning-forks be vibrating with equal energy beside each other, we may have either a S. of double the intensity, or anything less, down to perfect silence, according to their relative *phases*. If the branches of both be at their greatest elongations simultaneously, we have a doubled intensity—if one be at its widest, and the other at its narrowest, simultaneously, we have silence, for the condensation produced by one is exactly annihilated by the rarefaction produced by the other, and *vice versâ*. But if the branches of one be loaded with a little wax, so as to make its oscillations slightly slower, it will gradually fall behind the other in its motion, and we shall have in succession every grade of intensity from the double of either S. to silence. The effect will be a periodic swelling and dying away of the S., and this period will be longer the more nearly the two forks vibrate in the same time. This phenomenon is called a *beat*, and we see at once from what precedes, that it affords an admirable criterion of a perfect *unison*, that is, of two notes whose pitch is the same. It is easy to see, by the same kind of reasoning, that if two forks have their times of vibration nearly as 1 : 2, 2 : 3, etc.—i.e., any simple numerical ratio—there will be greater intervals between the beats according as the exact ratio is more nearly arrived at.

We must now consider, so far as can be done by elementary reasoning, the various simple modes of vibration of a stretched string, such as the cord of a violin. Holding one end of a rope in the hand, the other end being fixed to a wall, one can easily (after a little practice) throw it into any of the forms illustrated in figs. 1-5, the whole preserving its shape, but rotating round the horizontal line. If the tension of the rope be the same in all these cases, it is easy to see that the times of rotation must be inversely as the number of equal segments into which the rope is divided; for the various parts will obviously have the same form; and the masses and distances from the axis of rotation being proportional to their lengths, the Centrifugal Forces (q.v.) will be as the squares of the lengths, and inversely as the squares of the times of rotation. But these centrifugal forces are balanced by the components of the tensions at the extremities,

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in directions perpendicular to the horizontal line; which are, by hypothesis, the same for all the figures. Hence the time of rotation is directly as the length of each segment. Now (see PENDULUM) any such rotation is equivalent to two mutually perpendicular and independent pendulum vibrations of the cord from side to side of the

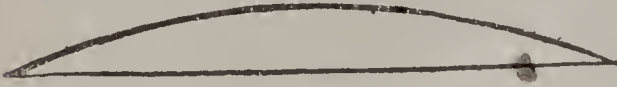


Fig. 1.



Fig. 2.

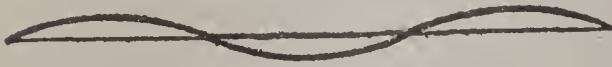


Fig. 3.



Fig. 4.



Fig. 5.

horizontal line. Thus, a violin-string may vibrate, according to the pendulum law, in one plane, either as a *whole* (fig. 1), as *two halves* (fig. 2), as *three thirds* (fig. 3.), etc.; and the times of vibration are respectively as 1, $\frac{1}{2}$, $\frac{1}{3}$, Nay, more, any two or more of these may coexist in the same string, and thus, by different modes of bowing, we may obtain very different combinations of simple sounds: a *simple sound* being defined as that produced by a single pendulum motion, such as that of a tuning-fork, or one of the uncomplicated modes of vibration of a string.

The various simple sounds which can be obtained from a string are called *Harmonics* of the fundamental note; the latter being the sound given by the string when vibrating as a whole (fig. 1). For each vibration of the fundamental note, the harmonics have two, three, four, etc. Of these, the first is the octave of the fundamental note; the second the twelfth, or the fifth of the octave; the third the double octave; and so on. Thus, if we have a string whose fundamental note is C, the series of simple sounds it is capable of yielding is:

C, C₁, G₁, C₂, E₂, G₂ (B_♭₂), C₃, D₃, E₃, etc.

Of those written, all belong to the ordinary musical scale except the seventh, which is too flat to be used in music. Facts such as are indicated in this passing remark are by many cited as showing how artificial is the theory of music, founded not on a physical, but on a sensuous basis.

To produce any one of these harmonics with ease from a violin-string, we have only to touch it lightly at $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, etc., of its length from either end and bow as usual. This process is frequent with musicians, giving a curious and pleasing effect with the violoncello or the double-bass. The effect of the finger is to reduce to rest the point of

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the string touched; and thus to make it a point of no vibration, or technically a *Node*.

In the case of a pianoforte wire (see PIANOFORTE), a blow is given near one end, producing a displacement which runs forward and back along the wire in the time in which the wire would vibrate as a whole. The successive impacts of this wave on the ends of the wire (which are screwed to the sounding-board) are the principal cause of the S.: but more of this case later.

The theory of other musical instruments is quite as simple. Thus, in a flute, or unstopped organ-pipe (see ORGAN), the S. is produced by a current of air passing across an orifice at the closed end. This produces a wave which runs along the tube, is reflected at the open end, runs back, and partially intercepts the stream of air for an instant; and so on. Thus the stream of air is intercepted at regular intervals of time, and we have the same result as in the Siren (q.v.). In this case, there is *one* node only, viz., at the middle of the pipe. If we blow more sharply, we create two nodes, each distant from an end by $\frac{1}{4}$ of the length of the tube. The interruptions are now twice as frequent, and we have the first harmonic of the fundamental note. And so on—the series of harmonics being the same as for a string. We may easily pass from this to the case of an organ-pipe closed at the upper end. For if, while the open pipe is sounding its fundamental note, a diaphragm is placed at the node, it will not interfere with the motion, *since the air is at rest at a node*. Thus, the fundamental note of a closed pipe is the same as that of an open pipe of double the length. By examining the other cases in the same way, we find that the number of vibrations in the various notes of a closed pipe are in the proportions 1 : 3 : 5 : 7 : etc., the even harmonics being wholly absent.

There is another kind of organ-pipe, called a reed-pipe, in which a stream of air sets a little spring in vibration so as to open and close, alternately, an opening in the pipe. If the spring naturally vibrates in the time corresponding to any harmonic of the pipe, that note comes out with singular distinctness from the combination—just as the S. of a tuning-fork is strongly reinforced by holding it over the mouth-hole of a flute which is fingered for the note of the fork. If the spring and the tube have no vibration in common, the noise produced is intolerably discordant. The Oboe, Bassoon, and Clarionet are mere modifications of the reed-pipe; so are Horns in general; but in them the reed is supplied by the lip of the performer: thus, a Cornet, a Trumpet, or a French Horn, gives precisely the same series of harmonics as an open pipe.

The statements just now made as to the position of the nodes in a vibrating column of air are not strictly accurate, for the note is always found to be somewhat *lower* than that which is calculated from the length of the tube and the velocity of sound. Hopkins showed experimentally that the distance between two nodes is always *greater* than twice the distance from the open end to the nearest

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node. The mathematical difficulties involved in a complete investigation of the problem were first overcome by Helmholtz 1859: see an admirable paper in *Crelle's Journal*. The results are found to be in satisfactory accordance with those previously derived from experiment.

We have now to consider the subject of the quality of musical sounds; and one of its most important branches—what constitutes the distinction between the various vowel-sounds. It had long been recognized that the only possible cause of this distinction between sounds *musically identical* must be in the nature of the fundamental noise; or, to express it differently, in the nature of the periodic motion of each particle of air. But it appears that Helmholtz was the first to enter on a complete examination of the point, both mathematically and experimentally; and his results are among the remarkable contents of his excellent work, *Sensations of Tone* (*Die Lehre von den Tonempfindungen*).

It was established by Fourier, that any periodic expression whatever may be resolved into the sum of a number of simple harmonic terms, whose periods are, respectively, that of the original expression, its half, its third part, etc. Hence any periodic motion of air (i.e., any musical S.) may be resolved into a series of simple pendulum vibrations (i.e., pure musical sounds, such as those of tuning-forks); the first vibrating once in the given period, the second twice, and so on. These notes are, as we have seen, the several harmonics of the lowest. Hence the quality of a musical S. depends on the number and loudness of the harmonics by which it is accompanied.

Two experimental methods were employed by Helmholtz, one analytical, the other synthetical. In the first he made use of resonance-cavities fitted to the ear, and giving scarcely any indication of external sounds until one is produced which exactly corresponds in pitch with the note which the cavity itself would yield. With a series of such cavities, tuned to the several harmonics of some definite note, the note was examined when played on various instruments, and when sung to different vowel-sounds: it was thus ascertained which harmonics were in each case present, and to what extent, producing the particular quality of the sound analyzed. The second method was founded on the fact, above noticed, that a tuning-fork gives an almost pure musical S. (i.e., free from harmonics). A series of tuning-forks, giving a note and its harmonics, were so arranged as to be kept constantly in vibration by an electric-magnetic apparatus. Opposite to each was fixed a resonance-cavity exactly tuned to it, and capable of being opened more or less at pleasure. When all the cavities were shut, the S. was scarcely audible; so that by opening them in various ways, any combination of harmonics might be made to accompany the fundamental note. These combinations were varied by trial, until the quality of the resultant S. was brought to represent as nearly as possible that of some vowel. The results of this second series of experiments coincided with those of the

first. It appears from these investigations that the German U is the quality of a simple sound, though improved by adding faintly the two lowest harmonics; that O depends mainly on the presence of the third harmonic; and so on with the other sounds. It appears also, and it is well known by experience, that different vowel-sounds, to be sung with accuracy, require to be sung to different notes, the proper note being that for which the cavity of the mouth is adapted for production of the accompanying harmonics which determine the quality of the particular vowel.

In strings and pipes, as we have seen, the higher notes are strictly harmonics of the fundamental note; therefore the sounds of instruments which depend on these simple elements are peculiarly adapted for music. On the other hand, when, as in masses of metal, etc., the higher notes are not harmonics of the fundamental note, the mixed S. is always more or less jarring and discordant. Such is the case with bells, trumpets, cymbals, triangles, etc.; and, in fact, these sounds are commonly characterized as 'metallic.' To produce from such instruments a S. as pleasing as possible, they must be so struck that as few as possible of the higher notes are produced, and these as feebly as possible. Thus, e.g., to get the most pleasing S. from a pianoforte-wire, the stroke should be not at the middle, as in such a case the first, third, fifth, etc., harmonics of the fundamental note will be lacking. If, however, it be struck at about $\frac{1}{7}$ of its length from one end, the harmonics produced will be mainly the first five; and these all belong to the chord of the fundamental note.

On the general subject of S., see ACOUSTICS: also consult Tyndall, *Lectures on Sound*; Helmholtz, *Sensations of Tone*; Ganot, *Physics*.—For a recent theory contravening the standard statements of the Undulatory Theory, see SUBSTANTIALISM.

SOUND'ING, DEEP-SEA: exploration of the ocean-bed at great depths: its object is mainly to ascertain the contours of the sea-bottom, and so to determine feasible routes for submarine electric cables: such soundings are made also for purely scientific purposes, as determining problems of biology, physiography, etc. In deep-sea S. the temperature of the sea is taken at the bottom and at intermediate depths by means of a registering thermometer of special construction.

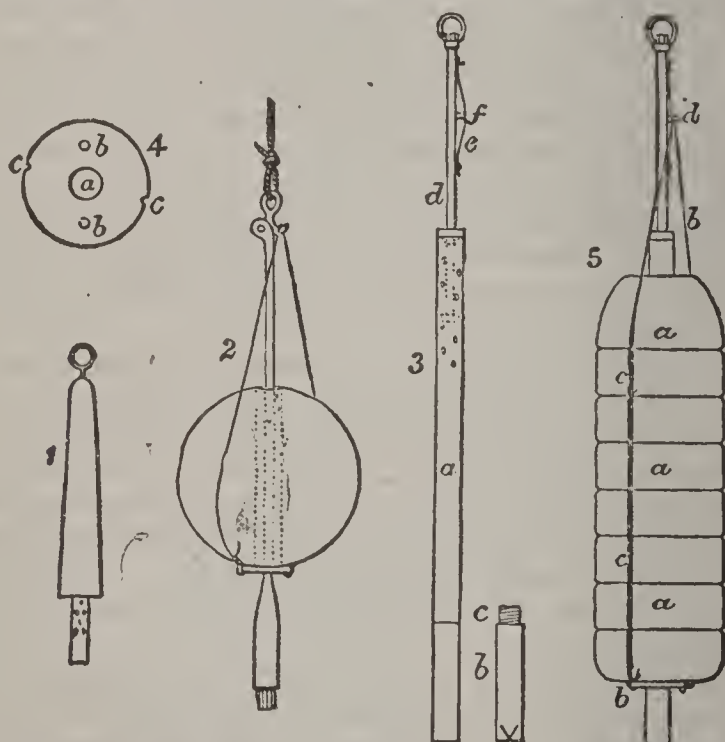
The act of obtaining a deep-sea S. may be said to consist of two parts—1. To cause the sinkers to reach the bottom as quickly as possible with the line straight up and down; 2. To bring a portion of the soil of the bottom, as a proof, to the surface; this necessitates the use of a small but strong line, with heavy sinkers and a detaching apparatus for freeing the sinkers when they reach the bottom; as from the smallness of the line and the great friction of all passing through the water, the strain of bringing the sinkers up would be too great for its strength. There is no difficulty in obtaining a S., and regaining the sinker, with bottom specimen, as far as a depth of 1,000 to 1,200 fathoms

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($1\frac{1}{2}$ m.), by means of a heavy lead fitted with a valved tube (fig. 1); but for a depth beyond 2,000 fathoms, the difficulties in obtaining correct S. increase in compound ratio with the depth.

The first detaching apparatus (fig. 2), was devised by Brooke, midshipman of the U. S. navy: it is extremely simple and efficient. It consists of a rod with a movable hook at the upper end, and a tube at the lower end. The sinker is a perforated shot, through which the tube passes, and by means of a ring below the shot the weight is suspended to the hook by wire, the hook being kept up by the sounding-line; the tube is filled with cut quills. When the weight touches the ground, the line is slackened, the hook falls, and the suspending wire being freed, the shot slides off; while the quills, being thrust into the soil, secure a small portion, which is brought up with the rod.

Many different kinds of detaching apparatus have been invented since, but that made use of on the British govt. vessel *Challenger*, in her deep-sea exploration voyage, is but a modification of the original Brooke's machine. The Hydra machine (fig. 3) consists of a tube of iron, $2\frac{1}{2}$ inches in diameter, $4\frac{1}{2}$ ft. in length, *a*; the lower 12 inches, *b*, is separate from, but screws to the upper part at *c*; it is fitted with a butterfly valve at the lower end, to retain the bottom specimen. At the upper end of the tube is a piston-



rod *d*, which moves freely in the tube. To the upper part of this rod is fixed a steel spring, bent in a bow *e*; a slit in the spring is adapted to the hook *f*, which protrudes beyond the spring when the latter is forced back. The sinkers (fig. 4) are cast-iron disks of half a cwt. each, the hole through the centre, *a*, being sufficiently large for the sounding-tube to pass through. They are made to fit each other by means of small conical protuberances on the one side, and corresponding hollows on the other, *b*; so

that when placed one on another, the groove *c* in the one weight corresponds to that on the other. The upper and lower sinkers differ a little in form.

When a S. is to be taken, the machine is prepared as in fig. 5, a wooden stand being used for the purpose. The sinkers, *a, a*, are piled to the required weight, say 400-500 lbs. (but with a wire line a weight of 50-60 lbs. suffices); the tube is then passed through them, and an iron ring (with a bight of iron wire attached), *bb*, is passed on the lower end of the tube, and the wire led along the continuous grooves on each side of the sinkers *c*, and the bight passed over the hook *d*, the spring being pressed back. When the weight of the sinkers rests on the ring, and is supported by the wire, the weight keeps the spring pressed in; but as soon as the sinkers touch the ground, and the weight is relieved from the wire, the spring throws it off the hook, and the tube is drawn clear through the sinkers.

When the tube, with sinkers complete, is ready, it is carefully hoisted over the side, lowered gently into the sea, and eased down one or two hundred fathoms before being let go. It is then let go, and the passing of each 100-fathoms mark is timed and recorded in a printed form made to contain all the particulars of the sounding.

Instead of a hempen line, a wire is now universally employed in deep-sea S.: this method was introduced by Sir William Thomson.

Many very deep soundings are on record, but the two deepest well-authenticated are among those obtained by the *Challenger*. The first was about 80 m. n. of the Virgin Islands, the depth being 3,875 fathoms, nearly $4\frac{1}{2}$ m. Unfortunately, not thinking that so near the island so great a depth would be found, only 3 cwts. of sinkers were used (the usual quantity for such extreme depths being 4 cwts.): this weight, with a one-inch line, took 1 hour and 12 minutes to reach the bottom. As the ascertainment of the sinkers reaching the bottom depends on the time intervals, it is to be noted that the line let free to run with this weight would take about 43 seconds running out the first 100 fathoms, and the time increases as nearly as possible three seconds for each successive 100 fathoms; so that when the interval is prolonged beyond this rate, the sinker has reached the bottom. On this occasion the last 50 fathoms ran out at the rate of 2 minutes 36 seconds per 100 fathoms. The other was n. of New Guinea, where the depth was 4,475 fathoms, more than 5 miles.

An idea of the average depth of the n. Atlantic may be had from the fact that of 108 soundings obtained by the *Challenger*, 48 were between 1,000 and 2,000 fathoms, 56 between 2,000 and 3,000, while only the other 4 exceeded 3,000.

SOUP.

SOUP, n. *sôp* [F. *soupe*, broth: Sw. *soppa*, a sop: Icel. *supa*, to sup up liquids (see SOP)]: kind of rich broth with flesh as an ingredient. SOUP-KITCHEN, establishment supported by voluntary contributions for preparing and supplying soup to the poor. SOUP-PLATE, deep plate in which soup is served at table. SOUPE MAIGRE, n. *sôp mǎ'gr* [F. *soupe*, soup; *maigre*, thin, lean]: soup made with vegetables, with a little butter and condiments; herb or fish soup.—*Soup* is a liquid form of food, obtained from flesh and vegetables, or from vegetables alone; and sometimes from fish.

A notion of what *Soup* really is, and what relation it bears to the solid ingredients which enter into its composition, is afforded by the researches of Liebig. When finely chopped muscular flesh (or butcher-meat) is lixiviated with cold water, and exposed to pressure, there is left a white fibrous residue consisting of muscular fibres, of connective or areolar tissue, and of vessels and nerves. This lixiviated flesh is of precisely the same quality from whatever animal it is obtained, communicates no flavor to water in which it is boiled, cannot be masticated, and, as Liebig observes, 'even dogs reject it.' When the cold water has taken up all that it is capable of extracting, it is found that it has dissolved 16–24 per cent. of the dry chopped flesh. This watery infusion contains all the savory and much of the nutrient matter of the flesh, and is usually of reddish tint, from the presence of a little of the coloring matter of the blood. On gradually heating it to the boiling-point, the albumen of the flesh (varying in amount from 2 to 14 per cent. according as the animal was old or young) separates in nearly colorless flakes when the temperature has risen to 133° F., while the coloring-matter of the blood does not coagulate till the temperature rises to 158° F. The liquid is now clear, and of pale yellowish tint; and as it reddens litmus-paper, it must contain a free acid. The infusion of flesh thus prepared has the aromatic taste and all the properties of a S. made by boiling the flesh. When evaporated, it becomes darker-colored, and finally brown; and on ceasing to lose weight, there is obtained a brown, somewhat soft mass of 'Extract of Flesh,' amounting to about 12 per cent. of the weight of the original flesh, supposed to be dried. 'This extract,' says Liebig, 'is easily soluble in cold water, and when dissolved in about 32 parts of hot water, with the addition of some salt, gives to this water the taste and all the peculiar properties of an excellent S. The intensity of the flavor of the dry extract of flesh is very great; none of the means employed in the kitchen is comparable to it in point of flavoring power.' The S. thus made of the flesh of different animals (e g., the ox and the fowl) possesses, with the general flavor common to all soups, a peculiar taste, which distinctly recalls the smell or taste of the roasted flesh of the animal employed. To obtain the strongest and best-flavored S., chopped flesh should be slowly heated to boiling with an equal weight of water; the boiling should be continued only a few minutes

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(for prolonged boiling only gives rise to formation of gelatine, a substance of no nutrient value, from the connective tissue of the flesh), and the S. should be then strained off from the solid residue. As a matter of economy, it is often desirable that the meat should be left in an eatable state, which is not the case when S. is made according to the preceding directions. To attain this end, the joint or mass of flesh should be set on the fire with cold water, which should be gently heated to boiling; the flesh thus undergoes a loss of soluble and savory matters, while the S. becomes richer in them. The thinner the piece of flesh, the greater the loss. Hence the method of boiling which yields the best S. gives the dryest, toughest, and most tasteless meat. 'The juice of flesh,' says Liebig, 'contains the food of the muscles; the muscular system is the source of all the manifestations of force in the animal body; and in this sense we may regard the juice of flesh as the proximate condition of the production of force. S. is the medicine of the convalescent, and as a means of restoring the exhausted strength it cannot be replaced by any article of the Pharmacopœia. Its vivifying and restoring action on the appetite, on the digestive organs, the color, and the general appearances of the sick, is most striking.'—See NUTRITION.

Most soups contain an admixture of meat and vegetables in their preparation; but many good soups can be made either entirely without flesh, or with fish instead of flesh. In the former class is pea-S. (which is, however, much improved if a piece of bacon enters into its composition), green-pea S., carrot-S., potato-S., asparagus-S.; while for fish-S., pike, tench, and eels are specially used. The basis of all good soups, except those in the preceding category, is *stock*, or broth made from all sorts of meat, bones, remains of poultry or game, etc., put together and stewed in the *stock-pot*.—See BROTH: MEAT-EXTRACT: BEEF-TEA.

SOUR, a. *sour* [AS. *sár*; Ger. *sauer*; Icel. *súrr*; Dan. *suur*; Dut. *zuur*; W. *sûr*, sour]; acid; having a pungent taste; harsh of temper or disposition; morose; turned, as milk: N. in *OE.*, an acid substance: V. to make or become acid; to cause to have a sharp taste; to acquire the quality of tartness; to make harsh in temper; to become crabbed or peevish; to make discontented; to embitter. SOUR'ING, imp. SOURED, pp. *sourd*. SOUR'LY, ad. *-lî*. SOUR'NESS, n. *-nēs*, acidity; sharpness to the taste; harshness of temper; asperity. SOUR'ISH, a. *-îsh*, somewhat sour. SOUR-DOCK, sorrel, which see. SOUR-KROUT, *-krowt*, sauerkraut, which see. SOUR GRAPES, things we depreciate and despise simply because they are beyond our reach—from Æsop's fable of the Fox and the Grapes.—SYN. of 'sour, a.': sharp; acid; tart; harsh; crabbed; acetose; acetous; acrimonious; dogged; peevish; currish; austere; acrid; pungent; morose; severe; afflictive; painful; bitter.

SOURCE—SOUTANE.

SOURCE, n. *sōrs* [F. *source*, a spring: F. *sourdre*; Prov. *sorzer*; It. *sorgere*, to rise, to bubble up as water—from L. *surgĕrĕ*, to rise]: the spring or fountain from which a stream of water flows; first cause; first producer; original; the person or that which gives rise to anything.—**SYN.**: beginning; commencement; origin; original; rise; reason; cause; spring; fountain; head.

SOURSOP, n. *sowr'sōp*: a W. India fruit, white, pulpy, and succulent, of the apple kind, so named from the slightly acid taste and character of the fruit, which is much relished by the people of the W. Indies; it is the fruit of the small tree *Anōnā muricātā*, ord. *Anonacĕæ*: an acrimonious person.

SOUS, *sōz* [F.]: the plu. of **SOU**, which see.

SOUSA, *sō'zā*, **JOHN PHILIP**: musical conductor and composer: 1859— ————; b. Washington, D. C. At an early age he showed extraordinary musical talent, and at the age of 26 became leader of the U. S. marine band at Washington, which position he held for 12 years, when he removed to New York and organized a band of his own. His compositions are popular, but he is renowned chiefly for his march music.

SOUSE, v. *sows* [prov. Eng. *soss*, a place wet and dirty: Scot. *soss*, the flat sound of a heavy soft body falling on the ground: Norw. *sussla*, to dabble in the mud]: to plunge suddenly, or make a sudden plunge, into water; in *OE.*, to strike with sudden violence, as a bird its prey; to fall on its prey with a swoop, as a bird: N. in *OE.*, a violent attack, as a bird striking its prey: AD. all at once; on a sudden. **Sous'ING**, imp.: N. a plunge over head and ears in water. **SOUSED**, pp. *sowst*.

SOUSE, n. *sows* [OF. *sause*; F. *sauce*, sauce—from L. *salsus*, salted (see **SAUCE**)]: pickle made with salt; something kept in pickle; the pickled ears, feet, etc., of swine: V. to soak or steep in pickle. **Sous'ING**, imp. **SOUSED**, pp.

SOUTANE, n. *sō-tân'* [F. *soutane*; It. *sottana*, a cassock—from mid. L. *subtana*, a clerical cloak—from L. *subtus*, underneath]: long close black garment (called also Cassock) worn in civil life (commonly with a flowing overdress or robe) by Rom. Cath. ecclesiastics, when the strict law of clerical costume is in force: also ordered to be worn under the priestly robes used in the public ministerial offices of the clergyman. The same garment, known as Cassock, is worn by many Prot. Episc. priests.—In the Roman Church it is not peculiar to bishops, priests, or even clerics in holy orders, but may be worn by all who have received even the **TONSURE** (q. v.). Indeed, the Council of Trent (*Dec. de Reform.*, sess. 23, c. vi.) declares that no cleric shall be held entitled to the 'privilege of clerics' unless he shall wear the S. The ordinary material is serge or woollen cloth; but it is often of more precious stuffs. The color for the secular clergy is commonly black: but dignitaries wear other colors. Thus the pope wears white—cardinals, red—bishops, violet—many canons, blue; and in religious orders and collegiate bodies the color is regulated by special laws. Formerly its obligatory use was general.

SOUTER—SOUTH.

SOUTER, n. *sô'tër* [L. *sutor*, a shoemaker—from *suo*, I sew]: in *Scot.*, a cobbler; a shoemaker.

SOUTH, n. *sowth* [AS. *súth*; Dut. *zuid*; Ger. *süd*; Icel. *sudr*; Sw. and Dan. *syd*, south]: one of the four cardinal points; the direction opposite to the north: **ADJ.** being in the south: **AD.** toward the south. **SOUTHEAST**, n. the direction between south and east: **ADJ.** in the direction of or coming from the southeast. **SOUTHEASTERLY**, a. proceeding from or going to the southeast. **SOUTHEASTERN**, a. toward the southeast. **SOUTHERLY**, a. *súth'ér-lǐ*, coming from or going to the south, or to a point nearly south. **SOUTH'ERN**, a. *-érn*, lying toward the south. **SOUTH'ERNER**, n. *-ér*, or **SOUTH'RON**, n. *-rôn*, an inhabitant of the more southern parts of a country; in *Scot.*, an Englishman. **SOUTH'ERNMOST**, a. *-érn-mōst*, farthest toward the south. **SOUTHING**, a. *sowth'ing*, going toward the south: **N.** tendency to the south; the distance a ship makes good in a south direction. **SOUTHMOST**, a. *sowth'mōst*, farthest toward the south. **SOUTHNESS**, n. *-nès*, the tendency in the south end of a magnetic needle to point toward the south pole. **SOUTHWARD**, ad. colloquially *súth'érd*, toward the south: **N.** the southern regions. **SOUTHWARDLY**, ad. *-lǐ*. **SOUTHWEST**, n. *sowth'wèst*, the point equally distant from the south or west, or the point between them: **ADJ.** coming from the southwest. **SOUTHWEST'ERLY**, a. *-ér-lǐ*, in the direction of southwest, or nearly so; coming from the southwest. **SOUTHWEST'ER**, n. *-ér*, among *seamen*, a storm or gale from the southwest; a painted-canvas hat with round top and a broad flap for falling over the neck, for use at sea in stormy weather, also worn by coal-heavers—usually pronounced *sow-wèst'ér*. **SOUTHWEST'ERN**, a. *-érn*, in the direction of southwest. **SOUTH FRIGID ZONE**, the zone of the earth contained between the south pole and the Antarctic circle. **SOUTH TEMPERATE ZONE**, the zone of the earth contained between the tropic of Capricorn and the Antarctic circle. **SOUTHERN CROSS**, a constellation of the southern hemisphere, having the appearance of the figure of a cross. **SOUTHERN HEMISPHERE**, one of the two hemispheres of the earth, lying to the south of the equator. **SOUTHERNWOOD**, n. *súth'èrn-wúð*, a common aromatic plant, allied to the wormwood (see **ARTEMISIA**).

SOUTH, *sowth*, **ROBERT**, D.D.: brilliant writer and zealous Anglican priest: 1633–1716, July 8; b. Hackney; son of a London merchant. His earlier education was at Westminster School, of which Dr. Busby was master; and 1651 he became a student at Christ-Church, Oxford. In 1654 and 57 successively, he took his degrees as bachelor and master of arts; and was ordained 1658. In 1654, at Oxford, he had congratulated Cromwell in Latin verses; in 1657, before his ordination, he had preached as a strong Calvinist and Presbyterian. In his new function of univ. orator, to which he was appointed 1660, he was fortunate enough to please Lord Chancellor Clarendon on his installation as chancellor of Oxford, and, in reward of his com-

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plimentary periods, S. was made his domestic chaplain. In 1663 he took his degree D.D.; the same year he was promoted to a prebendary stall at Westminster; and 1670, he became a canon of Christ-Church, Oxford. Afterward he became rector of Islip, in Oxfordshire, and was chaplain-in-ordinary to Charles II. It is said by some writers that he steadily declined to be a bishop; others assert that his naturally sarcastic and pugnacious temper probably precluded such an appointment, which his abilities would otherwise have procured. The designs of James II., tending to a Rom. Cath. revival, he regarded with deep disapproval and alarm; but so strong was his sense of the duty of submission to the reigning monarch, that he declined all share in the conspiracy to oust him in favor of the Prince and Princess of Orange. When, however, the revolution was accomplished, he gave in his adhesion to it. But, to his honor, he refused to profit in the way of preferment, by the deprivation of such of the higher dignitaries of the church as could not conscientiously go with him in recognition of the new order of things. A bigoted adherent of the Church of England, he waged unsparing war from the pulpit, and with his pen, against Puritanism and every other form of dissent, vigorously opposing the act tolerating non-conformists. Occasionally he occupied himself with discussions more strictly theological. He is now remembered chiefly by his sermons—masterpieces of vigorous sense and sound English, abounding in lively and witty turns, not always in severely decorous consonance with the seriousness of the subject. His style is brilliant and exuberant; his wit is not genial, but sarcastic. As a man, S. seems to have been of estimable character; of pure life and unblemished integrity, and notable for his charities. His entire works were sent from the Clarendon press in 7 vols. (1823), 5 vols. (1843). An edition in 2 vols. appeared London 1850.

SOUTH AFRICAN REPUBLIC (now the TRANSVAAL COLONY); n. of the Vaal river, s. of the Limpopo; till 1877 independent; 1877-81 a Brit. territory; annexed by Gt. Britain 1900. It formerly included the region n. of the Vaal river (whence its name) on both sides of the Magaliesberg or Cashan Mts., into which the emigrant Boers (see BOER) retired after annexation of the Orange Free State to the Brit. crown 1848. The boundaries of S. A. R., as defined by convention of London 1884, are: w., Bechuanaland; e., Portuguese ter't'y; s., Swaziland, Zululand, Natal and Orange Free State; 119,139 sq. m.: cap., Pretoria. This whole region is in general a vast plateau, sloping to the n., supported by the coast-line of mountains, which, presenting a bold mural buttress or escarpment to the low country at their feet, stretch away on their w. flank into vast undulating plains. At right angles to the coast-range, another belt of very high lands, the Magaliesberg, runs e. and w., forming a water-shed between the river-system of the Vaal or Orange and Limpopo rivers. The s. face of this range also presents long

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and undulating plains, generally well watered and wooded, and abounding with large game.

The average height of the plateau inhabited by the emigrant farmers of European descent is from 4,000 to 5,000 ft. Many of the peaks of the mountain-range traversing the plateau attain an elevation of 9,000 or 10,000 ft., and are covered with snow some months in the year. The altitude of the coast-line of mountains is estimated at 6,000 to 7,000 ft. above the low region at their feet.

The principal towns are—Moorivervorp, or Potoschefstroom, on the Mooi river; Pretoria, the capital, with a white pop. of 10,000; Leydenburg, 170 m. n. e. of Pretoria; Rustenberg, a few m. n. of the Magaliesberg; Zoutpansberg, about 40 m. s. of the Limpopo river; Wesselstroom, Heidelberg, and Johannesburg in the gold-mining district, with a pop. of 102,000.

The colony is divided into 15 districts, and is under a governor, lieutenant-governor, and executive council. Legislation is by ordinances. Municipalities with the usual powers for local administration, exist at Pretoria and other centres. For the financial year ending June 30, 1903, the revenue was £4,000,000; est. expenditure £3,702,765; public debt (1899) £2,660,394. The chief source of revenue was customs. The government revenue from the gold fields was about £650,000. The chief exports are gold, wool, cattle, hides, grain, ostrich-feathers, ivory, liquors, and minerals. The aggregate imports 1902 valued at £10,000,000. The principal industries are farming and mining. The country is rich in minerals, as coal, lead, silver, copper, iron, cobalt, tin, platinum and plumbago, but especially in gold, the gold fields of Barberton and Witwatersrand being especially rich; total output of gold for the colony (1902) 1,501,982 oz. There were (1895) 424 m. of railroad within the colony.

According to a treaty between Portugal and the Transvaal republic, the latter enjoyed free transit of all goods through the Portuguese harbors on the e. coast; and in order to save the import dues levied by the colony of Natal, diligent efforts were made to secure direct access, by road and rail, to Delagoa Bay. As this line passed through the dominions of an independent chief, the Boers were soon embroiled in desultory war with the latter. Their policy further provoked so intense excitement among the natives on the Kaffrarian frontier of the Cape Colony, and so seriously menaced the well-being of the Brit. settlements, that Britain interfered, and ultimately, 1877, Apr. 12, annexed the territory of the republic. A rising of the Boers took place in the end of 1886. The Brit. garrisons in the Transvaal were besieged, and a force of Boers crossed into Natal to meet the available Brit. forces advancing against them. The Boers took up a strong position at Laing's Nek, within the Natal frontier, from which the English forces failed to dislodge them; and in several engagements the Boers more than held their own. Peace was negotiated while large English reinforcements were on their way to s. Africa. It was agreed that the Transvaal should acknowledge the suzerainty of the

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Brit. sovereign; and, while complete self-government was granted to the Boers, the control of foreign relations (i.e., specially with the native tribes) was reserved.

In 1884 the independence of the republic was fully recognized in the convention of London, by which conflicting claims as to its territorial limits were settled. In 1890 a special commissioner to Great Britain submitted a proposition that the S. A. R. would withdraw from the n. and w. of Swaziland if Great Britain would withdraw from the e., and that the S. A. R. would enter into a customs union as soon as it got a suitable port.

In the social aspect of the country, marked progress is shown within the last few years. There has been large influx of Europeans and colonists of a more educated class than the original settlers. Dutch Reformed Church (formerly state church) claims 30,000 members. The climate is generally healthful, though n. of the Magaliesberg its tropical character begins to manifest itself. Hot winds and violent thunder-storms are frequent in summer. The fly *Tsetse*, whose bite is death to the bovine and equine species, infests many parts, and renders travelling with oxen and horses precarious. When Capt. Harris visited this region 50 years ago, the number of the larger Mammalia was enormous; and even Gordon Cumming, who hunted over part of it many years subsequently, found them still numerous. Crocodiles are numerous in the rivers, and a large species of boa is found. Pop. (1898) about 1,094,000, of whom 245,397 were whites.

The S. A. R. is rich in corn-land, and might become the granary of the interior. The discovery of gold in the early eighties brought an influx of foreigners, largely British, and heavy investments of Brit. capital. The city of Johannesburg in the centre of the Witwatersrand gold-fields was rapidly built up until it contained (1890) a pop. of 60,000, mostly foreigners, termed by the Boers *Uitlanders*. By the constitution of the S. A. R. these settlers were precluded from voting or holding office. Meanwhile they complained that they were excessively taxed and that none but Dutch schools were provided for their children. With these causes of complaint was joined the British ambition to secure a continuous strip of Brit. territory from Cairo to Cape Town through the heart of Africa, while the British South Africa Co. was eager to get full control of the Transvaal gold-fields, of which that company is said to have been in desperate financial need. Late in 1895, in Johannesburg, a provisional 'Transvaal National Union' was formed and a 'reform committee' appointed. Plans were laid for an uprising in Johannesburg in the interest of the British residents, and prominent citizens wrote to Dr. L. S. Jameson, administrator of Mashonaland, for aid. On the night of 1895, Dec. 29, Dr. Jameson with 700 armed men crossed the frontier. In the meantime, Pres. Krüger had pacified the people of Johannesburg by timely concessions, and the threatened uprising there was averted. Dr. Jameson with his whole force was defeated and captured by the Boer militia. These events produced great excitement in England. Dr. Jameson's action was officially disavowed. Cecil J.

SOUTH AMBOY—SOUTHAMPTON.

Rhodes, premier of Cape Colony, who was believed to have sanctioned the movement against the Boers, resigned 1896, Jan. 10, and was succeeded by Sir J. Gordon Sprigg. Pres. Krüger surrendered his prisoners to the Brit. authorities for trial by British law. The German emperor sent (1896, Jan. 3) a congratulatory telegram to Pres. Krüger which aroused great indignation in England as an infringement of the suzerainty which the British claim over the Transvaal; he sent also a promise of military aid to the S. A. R. In 1896, Jan., over 50 members of the 'reform committee' were arrested in Johannesburg, including Col. Francis Rhodes, whose brother, Cecil J. Rhodes, was director of the Brit. S. Africa Co. and premier of Cape Colony; including also a prominent American, John Hays Hammond. These with three other leaders were sentenced to death, but their sentences were afterward commuted to heavy fines. After the trial Pres. Krüger made public a series of captured telegrams, conclusively proving that Dr. Jameson's raid had been long projected and with the complicity of high officials of the Brit. S. Africa Co. In June Cecil Rhodes resigned as director of the company. June 28 Dr. Jameson and a number of his officers were sentenced in Eng. to various terms of imprisonment. July 30 the Brit. parliament appointed a committee of inquiry, which held protracted sessions, summoning among others ex-Premier Rhodes before them; but so evident was the purpose to exclude important evidence as to leave in the public mind the conviction that persons high in authority in England were concerned in the movement. In 1899 the S. A. R. and the Orange Free State invaded British territory, beginning a war which was virtually closed by the capture of Pretoria and the annexation of the colony 1900, Sept. 1, though hostilities continued till June 1902.

SOUTH AMBOY: borough, Middlesex co., N. J.; on Raritan Bay, at the mouth of Raritan river; and on the New Jersey Central and the Pennsylvania railroads. It has machine-shops, asphaltum and iron works, potteries, etc., and is the seat of Stevensdale Institute. Pop. (1880) 2,648; (1890) 4,330; (1900) 6,349.

SOUTH AMERICA: see **AMERICA**.

SOUTHAMPTON, *sŭth-ămp'ton*: municipal and parliamentary borough, important seaport, and county of itself, in s. Hampshire, England; 78 m. s.w. of London by the London and Southwestern railway. It occupies a peninsula at the head of Southampton Water, and between the estuary of the Test or Anton on the w. and s., and the mouth of the Itchen on the e. The High Street, the principal thoroughfare, extends from the water-side to the Bargegate, and thence to the outskirts of the town. Crossing the High Street at right angles are many important streets, and handsome lines of new houses are in the n. and w. suburbs. St. Michael's Church, oldest in the borough, contains Norman tower arches; and several private houses are of Norman architecture. The *Domus Dei*, or God's House, dates from the end of the 12th c., and is one of the

SOUTHAMPTON—SOUTHAMPTON WATER.

earliest hospitals in England. The docks can float the largest steamers, and have been greatly extended and improved. S. is the place of departure and arrival of the W. India and Brazil, the Mediterranean, E. Indian, China, and Australian, and the s. African mail steam-packets. There is considerable traffic between S. and the Channel Islands and French coast, also a large cattle-trade with Spain and Portugal. Its harbor is perhaps the most motley and picturesque in England, being frequently crowded with Lascars, Creoles, Arabs, etc., and, on the arrival of mail-steamers, with Indian and American planters, E. Indian nabobs, foreign dignitaries, naval officers, and other British and foreign officials in every variety of costume. There entered the port (1880) 9,221 vessels, of 1,416,352 tons; cleared 8,838, of 1,344,366 tons. Yacht and ship building and engine-making are actively carried on. S. is also a fashionable resort in summer. Pop. (1881) 60,235; (1891) 82,126; (1901) 104,911.

S. supplanted the ancient *Ulaesentum*, which stood about one m. n.e., and its foundation is ascribed to the Anglo-Saxons. It is called Hamtune and Suth-Hamtun in the Saxon Chronicle. After the Conquest, S., whence there was ready transit to Normandy, began to prosper rapidly, and in early times it traded with Venice and Bayonne, Bordeaux and Rochelle, Cordova and Tunis. A great part of it was burned by the combined French, Spanish, and Genoese fleets 1338; and in the following year its defenses were strengthened. S. is the birthplace of Isaac Watts (to whom a monument has been erected in the West Park) and of Thomas Dibdin.

SOUTHAMPTON, HENRY WRIOTHESLEY, third Earl of: 1573, Oct. 6—1624, Nov. 10; b. England: statesman. He accompanied the expedition of the Earl of Essex to Cadiz 1596; was gen. of cav. under that earl in Ireland 1599; under charges of complicity in the insurrection in London headed by the earl, he was convicted and sentenced to death, and attainder was pronounced; but he was relieved of the death penalty by Queen Elizabeth, and of the attainder by parliament after the accession of James I. He co-operated with Sir Walter Raleigh in the colonization of America, sending out the *Concord* expedition under Bartholomew Gosnold (q.v.) at his own expense; interested Lord Arundel and Cecil Calvert (q.v.) in the development of the new world; joined Lord Arundel in sending an expedition to New England; and became gov. of the Va. Company. He supported religious liberty firmly, and was an acknowledged patron of Shakespeare, who dedicated to him his *Venus and Adonis* (1593) and *The Rape of Lucrece* (1594).

SOUTHAMPTON WATER: fine inlet of the English Channel, stretching n.w. from the point at which the Solent and Spithead unite; 11 m. long and about 2 m. wide. The Isle of Wight, between S. W. and the Channel, forms a magnificent natural breakwater, and occasions a second high-water two hours after the first. S. W. receives the Test or Anton, Itchen, and Hamble rivers.

SOUTH AUSTRALIA.

SOUTH AUSTRALIA: an 'original state' of the Australian commonwealth, comprising the whole central section of Australia; extreme length n. to s, 1,850 m., width w. to e., 650 m.; 903,690 sq. m.; cap. Adelaide.

Character of the Soil, etc.—The n. portion of this vast territory has abundant rainfall; and is watered by numerous streams and rivers, some, e.g., the Victoria and the Adelaide, navigable for a considerable distance by ships. The soil is fertile, and suitable for tropical productions of every kind. In connection with the construction of the overland telegraph across the centre of the Australian continent, this region has become known as suitable for settlement.

The great central region opened by explorations of Stuart and M'Kinlay, and the country n. of lat. 33° , are suited only for pastoral purposes, on account of irregularity of rainfall and scarcity of permanent water; and except a few patches along the coast, the same description applies to the country w. of Gulf St. Vincent in 138° e. long. The s. e. division of the colony, between lat. 33° and the Southern Ocean, and between Gulf St. Vincent and the e. boundary of the colony, includes every variety of soil, ranging from absolute sterility to the highest degree of fertility—much of it being probably unsurpassed by any region in adaptability both in soil and in climate for growth of wheat, the vine, and the olive. This region is moderately timbered; the principal varieties being the gum, the stringy bark, and the pine, all useful for fencing and building purposes.

Climate.—A country extending over 27° of latitude must necessarily embrace great varieties of temperature; but the climate, owing to prevailing aridity, appears on the whole, healthful, and remarkably free from epidemic diseases. The average annual mortality during ten years has been found, in the settled districts, 15 per 1,000 as compared with 23 per 1,000 in England. Nearly half of the deaths are of children. The hottest months are Dec., Jan., Feb., and March. During these months, hot winds occasionally blow. But the same dryness of the air which accounts for the great exaltation of the temperature, renders it more endurable than might at first be supposed; and Europeans are able in the hottest weather to carry on harvest-labor without danger. Careful observations, in the agricultural part of the colony (i. e., s. of lat. 33°), and extending over a series of years, show the mean temperature during the four hot months to average 73.60° , and during the eight cold months, 56.30° , the extreme range being 117° – 32° . The rainfall in the n. or purely pastoral district, is as low as 7.947 inches; while in the s. or agricultural district, it averages as much as 48.59 inches.

Physical Aspect.—The surface of the country alternates between open plains and wooded ranges of moderate elevation, which inclose many beautiful and fertile valleys. The principal ranges are the Flinders range, which trends n. from the e. coast of Spencer Gulf to the neighborhood of Lake Torrens, lat. 30° , where it branches out into nu-

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merous spurs; and the Mount Lofty range, nearly parallel with Gulf St. Vincent from its head-water in lat. 34° to its termination at Cape Jarvis. The Mount Lofty ranges rise about 2,600 ft., running nearly n.e. and s.w., with breadth of more than 15 m. This district abounds in picturesque scenery, the summits being well wooded and the slopes of great beauty and fertility, affording eligible building-sites, and producing in highest perfection many English fruits and vegetables, which fail to thrive on the hotter and more arid soil of the plains.

Throughout S. A., the deficiency of running water is remarkable; in fact, for nearly 1,200 m. following the indentations of the coast from the w. boundary of the colony to the estuary of the Torrens, in Gulf St. Vincent, not even a brook of permanent fresh water finds its way into the sea. Eastward, this deficiency is to some extent compensated, partly by the streams which rise in the Mount Lofty range, the principal of which are the Torrens, the Onkaparinga, the Gawler, and the Sturt; but mainly by the Great Murray river: see AUSTRALIA: VICTORIA. Unfortunately for the complete utilization of this magnificent stream, its embouchure, long. 139° e., is exposed to the full force of the Southern Ocean, which, meeting the current, throws up a shifting bar, rendering the entrance from seaward dangerous, and practicable only for streamers drawing less than 7 ft. To counteract this drawback, a tramway has been constructed from Goolwa, connecting the river with Victor Harbor, a small but well-sheltered haven in Encounter Bay. Another railway connects North-West Bend, 150 m. up the river, with Port Adelaide; while a n. extension runs to Terowie, 140 m. inland.

Divisions, Towns, etc.—The state naturally falls into three sections—S. A. proper or the old portion; Central Australia and the Northern Territory, long. 129° – 138° e., n. of lat. 26° s.; containing 523,355 sq. m., and added to the former S. A. 1863. The settled part of the colony is divided into 44 counties for electoral purposes; 33 municipalities; and 140 districts. Beside Adelaide, the cap. (pop. 100,000), Glenelg had about 3,000; Burra 3,000; Kapunda 2,500; and Gawler 2,000. Port Adelaide (pop. 3,500), $7\frac{1}{2}$ m. from the cap., is the chief harbor; but there are several excellent minor ports.

Mineral Wealth, etc.—The mineral wealth of S. A. is great, the principal metals being copper, lead, and iron; the last is of the finest quality, but in the absence of coal, cannot be profitably worked. There were 12 copper-mines at work 1880, the principal being the Burra-Burra and the Kapunda, n.e. of St. Vincent Gulf; the Wallaroo and Moonta on York's Peninsula. Several gold-fields are worked, and mineral oil and marble have been found in paying quantities.

Colonization.—The country was selected 1837 as the site on which to test what was then a new principle in colonization, known as the Wakefield theory, from its author, Edward Gibbon Wakefield. The principle may be expressed in a single sentence thus: 'The waste lands of the

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crown, though entirely valueless prior to the application of labor and capital, acquire value according as these elements of wealth are applied to them in due proportions or otherwise; and the proceeds of the sale of these lands, if properly administered, will suffice to defray the cost of transporting the labor required for their cultivation, at the same time relieving the mother-country from the pressure of able-bodied pauperism.' A second and scarcely less important problem in economic science was put to the test on the same occasion—viz., 'The future revenues of a new colony, supplemented, if necessary, by a lien upon the lands, afford a basis of credit available for raising funds adequate to defray the cost of outfit and first settlement; and therefore the appropriation of the taxes of this country for such purposes is unnecessary and inexpedient.' Owing partly to an unfortunate delay in putting the first settlers in possession of the lands which they had paid for, but mainly to a monopoly by the government of the labor imported by the purchase-money of those lands, production was retarded during the first three years; and the necessaries of life, which might have been produced on the spot in abundance, had to be imported at enormous cost, and paid for out of capital—reducing the colony to the verge of bankruptcy. In 1841, the sound principles to illustrate which the colony was founded, were allowed to come into play. Government interference with the labor-market ceased; and within three years breadstuffs and other agricultural products were exported from S. A. in such quantities as to glut the markets which had previously supplied her necessities. From that date, the prosperity has been marvellous. S. A. has become the granary of the eastern settlements. (See statistics below.)

The waste lands are disposed of in fee-simple by public auction at the upset price of 20s. per acre; and lands once passed the hammer may be purchased at that price without competition. For pastoral purposes, lands are granted to the first applicant for a lease of 14 years at almost nominal rent. The system of free selection within certain surveyed districts now obtains, whereby 640 acres can be purchased on credit, at the ordinary upset price, on written application to the land-office, and on the signing of an agreement whose main conditions are—immediate payment of 10 per cent. of the purchase-money, and its payment in full in six years; or optionally, of half, on further interest on the remaining half, and the full payment in ten years; personal occupancy of the land; and the executing of improvements to the value of 7s. 6d. (about \$1.85) per acre before the end of the third year, and of 10s. (about \$2.50) before the end of the fourth year. Land open to the public for one year without being sold may be leased in blocks of not more than two sq. m. for 21 years, with right of purchase at the upset price during the lease. The difficulties, delays, and expenses attendant on the English system of conveying are removed by the Torrens Act, and land is rendered as easy of transfer, mortgage, and settlement as property in shipping. The great advantages secured by S. A.

SOUTH BEND.

under this act have caused it to be adopted throughout the Australian colonies.

Government, etc.—The legislative council and the house of assembly both are elective. Members to the council are chosen by electors with a small property franchise, for a period of 12 years; 8 members retire every 3 years. Members of the assembly are elected by universal suffrage, 52 every 3 years. Voting for both houses is by ballot, and the members of both receive \$1,000 per annum salary. The executive govt. is dependent on parliamentary majorities, as in England. No pecuniary aid is given by govt. to any religion, and all churches are on perfect equality. The system of public education is modelled on the Irish national system. Attendance is compulsory.

In 1894 imports amounted to about \$35,846,000, exports \$38,957,320; of the latter the export of wool amt'd to \$5,001,245, of wheat \$4,081,107, of flour \$2,139,487; 233,275 tons of breadstuffs were exp't'd. Land under cultivation (1901-02) amounted to 3,122,800 acres, of which 1,743,452 acres were under wheat, yielding 8,012,762 bush.; 369,796 under hay; 16,315 under orchards; 20,860 vineyards, yielding 2,077,923 gals. of wine. The live stock (1901) numbered: horses 165,303; cattle 225,226; sheep 48,324. There were (1901) 5,014 m. of govt. railway, and 5,763 m. of telegraph and telephone lines. The copper product (1901) was valued at \$2,375,824.

The places of public worship in the colony (1901) numbered 969. Schools numbered 284 public, 422 provisional, 290 private; pupils in all 69,115. Education is secular, compulsory, and free of charge.—See an elaborate descriptive work, *South Australia*, by William Marcus (1876); Silver's *Handbook to A.*; and the annual issue of the *Australian Handbook*.

SOUTH BEND: city, cap. of St. Joseph co., Ind.; on the St. Joseph river, and on the Chicago and Grand Trunk, the Lake Shore and Michigan Southern, the Michigan Central, and the Vandalia Line railroads; 85 m. e. of Chicago. It is attractively laid out and ornamented with handsome shade-trees, and has broad streets paved with cedar blocks, stone, brick, and native cement, and well graded and gravelled suburban roads. The city has long been noted for its manufactures, especially of carriages and wagons; and of 10 such establishments one covers 83 acres and employs 1,500 men. There are 4 plow-works; sewing-machine case, clover-huller, boiler, steel-skein, pump, toy-wagon and croquet works, foundries and machine shops; and woolen, silk and shirt factories. In 1900 there were 302 manufacturing establishments of all kinds. Water-power is provided by the river which bisects the city. S. is supplied with water for domestic purposes by 16 artesian wells, of aver. depth 125 ft., controlled by 4 powerful pumps. It is lighted with gas and electricity; has elec. street railroads, and contains 30 churches; 10 public schools; the Univ. of Notre Dame (Rom. Cath.), founded 1842, rebuilt after fire 1879; St.

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Joseph's Acad.; St. Mary's Acad.; the Acad. of the Assumption; county court-house; public library; opera-house; 4 hotels; hospital; 4 nat. banks (cap. \$336,000); 1 sav. bank; 2 daily, 3 weekly, and 1 semi-monthly publication; tobacco factories; flour and grist mills, and foundries and machine shops. The principal industries are the manufacture of carriages and wagons and agricultural implements. On 1903, Jan. 1, the total debt was \$339,500, which included the water debt (\$238,000); the water sinking fund \$52,382; the assessed valuation of taxable property \$15,900,610, of which \$14,689,730 was real and \$1,210,880 personal property; tax rate \$1.25 per \$1,000. The Univ. of Notre Dame has 65 instructors, 934 students, 55,000 vols. in its library, and \$2,000,000 invested in grounds and buildings. St. Mary's Acad. (Rom. Cath.) opened 1844, has 35 instructors, 230-pupils, and 4,000 vols. in its library. S. was laid out 1831, with pop. 150, and began to be an important manufacturing place 1861. Pop. (1880) 13,280; (1890) 21,819; (1900) 35,999.

SOUTH BETHLEHEM, *béth'le-hém*: borough in Northampton co., Penn.; on the Lehigh river, and on the Lehigh Valley and the Philadelphia and Reading railroads; opposite Bethlehem (q.v.), 5 m. e. of Allentown, 12 m. s.w. of Easton, the co.-seat. It is in a region unusually rich in zinc, iron ore, coal, and slate; and with valuable deposits of important stones, including limestone. Lying at the foot of the Lehigh Mountain, it commands a range of scenery as picturesque as any in Penn. S is the seat of Lehigh Univ. (q.v.), and has 13 churches, a young ladies' seminary, pub. schools, opera-house, 1 nat. bank (cap. \$50,000), 1 state bank (cap. \$500,000), manufactories of Bessemer steel, zinc, brass goods, boilers, iron and steel rails, shovels, silk and knitted goods, machinery, organs and foundry products, and 2 daily and 1 tri-weekly periodicals. Pop. (1880) 4,925; (1890) 10,302; (1900) 13,241.

SOUTHBRIDGE: town in Worcester co., Mass.; on Quinnebaug river, and on the New York and New England railroad; 20 m. s.w. of Worcester, 70 m. s.w. of Boston. It has 8 churches, high and graded public schools, public library, 1 national bank (cap. \$100,000), 1 savings bank, 3 weekly newspapers; and manufactories of woolen and printed goods, optical instruments, cotton cloth, cassimeres, reps, twine, and cutlery. Pop. (1880) 6,464; (1890) 7,744; (1900) 10,025.

SOUTH CAROLINA.

SOUTH CAROLINA, *kǎr-ō-lī'na* : state; one of the 13 original states in the American Union; s. part of the province of Carolina created 1663 by Charles II. of England; popularly known as 'the Palmetto state.'

Location and Area.—S. C. is in lat. $35^{\circ} 31'$ — $32^{\circ} 4'$ n., long. $78^{\circ} 28'$ — $83^{\circ} 18'$ w.; bounded n. and n.e. by N. C., e. and s.e. by N. C. and the Atlantic Ocean, s.w. by Ga.; shape, irregular triangle; extreme length 275 m.; extreme breadth 210 m.; coast line 200 m.; 30,570 sq. m. (19,564,800 acres); cap. Columbia.

Topography.—The face of the country discloses four peculiarities: (1) a string of low sea-islands lying off the coast s.w. of Charleston, and separated from each other and the mainland by shallow inlets; (2) a tract of sandy and quite level alluvial ground, with occasional swamps and marshes, extending about 100 m. back from the coast; (3) the middle or sand hill country, low and fertile, which rises to the 'ridge'; and (4) a more pleasant and diversified tract, successively terraced till it reaches the highest point in the state—Table Mountain (4,000 ft.)—in the Blue Ridge range. The state is well drained, the principal rivers rising in the Blue Ridge Mountains and flowing s.e. to the ocean. The most important rivers are the Savannah, which is the boundary between S. C. and Ga., the Great Pedee, the Santee, and the Edisto. The Savannah is formed by the Tugaloo and the Keowee, which, rising in N. C., unite in S. C. at Anderson, whence the main stream flows to the ocean 18 m. below Savannah. It is navigable for steamers to Augusta, 230 m., and small boats may proceed 150 m. further. The Great Pedee, known in N. C. as the Yadkin, empties into Winyaw Bay, and is navigable to Cheraw, 150 m., above which are falls. The Santee proceeds from a union of the Wateree and the Congaree in the centre of the state to the ocean, discharging through two mouths, the North and the South Santee. The Santee proper is navigable its entire length, and by its tributaries small boats may ascend nearly 300 m. from the ocean. The Edisto drains the central and s.e. parts of the state, and near the ocean is diverted by an island into two mouths. The coast line is indented by numerous bays, sounds, and inlets, some of which have large commercial and historic interest. The principal are Winyaw Bay (14 by 2 m.), Bull's Bay, Charleston Harbor, St. Helena Sound (10 by 3 m.), Stono Inlet, and Beaufort Harbor or Port Royal entrance. The sea-islands, noted for production of long-stapled cotton (considered the best in the world) and rice, are Black Oak, Bull's, Cape, Caper's, Cedar, Edisto, Hunting, Kiawah, North, and St. Helena.

Climate.—From the location of the state its climate would be supposed to be uncomfortably hot, but modifications by sea and mountain breezes produce a temperature similar to that in s. France. The rainfall ranges from 51–60 in. on the coast to 40–44 in. in the mountains, with 44–52 in. in the interior. At Charles-

SOUTH CAROLINA.

ton the mean annual temperature, noted for 30 years, was 65.6°, summer mean 80°, winter 52°, spring 66.3°, autumn 65°. Malaria prevails in the swamp and phosphate rock regions, and the region of Charleston has had epidemics of yellow fever.

Geology.—Primitive formations prevail in the n. portion of the state, and alluvial in the s. Porphyritic granite is found in the Camden and Buffalo creek regions; red granite near Columbia; syenites in Abbeville, Fairfield, and Lexington counties; white and variegated marbles in Spartanburgh and Laurens; gneiss in Pickens and York; red and yellow ochres in Chesterfield; limestone in Spartanburgh and Laurens; manganese in nearly all the n. counties; coal in Chesterfield and Marlboro; gold in Abbeville, Edgefield, Lancaster, Pickens, Spartanburgh, Union, and York; lead in Pickens; black lead in Pickens and Spartanburgh; and iron ore in several n. portions. In the lowland the vegetation is sub-tropical, yielding the beautiful palmetto, bayonet-leaved shrub, magnolia, bay laurel, live-oak, and several other varieties of evergreens. Pine and cypress forests abound in gray spring moss, which floats lazily in the breeze. The usual forest trees of the middle states extend down to the uplands and mountain regions, the forests have abundance of valuable woods, 20 varieties of oak beside the live-oak, 5 varieties of pine, black walnut, cedar, hickory, chestnut, ash, and elm. There are 3,500 species of flora, a considerable part of which is medicinal. Grapes, canning and table fruits, and many varieties of nuts thrive. Excellent grazing is found in the n. counties, and dairying and stock-raising are becoming promising industries.

Zoology.—Numerous birds of prey abound, including the carrion and several other species of vulture, eagles, hawks, and gulls; some bears and wolves; and many racoons, opossums, ground-hogs, rabbits, and squirrels. Game and aquatic birds in large variety are prolific; the rivers and coast waters afford excellent fishing; and the forests are alive with birds of song and rich plumage. There are also many varieties of reptiles, such as alligators and lizards; tortoises and turtles; and serpents, of which a few are venomous.

Agriculture.—In 1880 the farm-lands covered 13,457,613 acres (of which 4,132,050 were improved); comprised 93,864 farms, valued with fences and buildings at \$68,677,482; contained implements and machinery valued at \$3,202,710; had live-stock valued at \$12,279,412; cost for repairs and new buildings \$917,000; and fertilizers \$2,659,969; and yielded products valued at \$41,969,749. The principal products were: barley 16,257 bushels; Indian corn 11,767,099; oats 2,715,505; rye 27,049; wheat 962,358; hay 2,706 tons; sugar 229 bhd.; molasses 138,944 gals.; rice 52,077,515 lbs.; cotton 522,548 bales; Irish potatoes 144,942 bushels; sweet potatoes 2,189,622; tobacco 45,678 lbs.; wool 272,758 lbs.;

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milk 257,186 gals.; butter 3,196,851 lbs.; cheese 16,018. The live-stock comprised 60,660 horses; 67,005 mules and asses; 24,507 working oxen; 139,881 milch cows; 199,321 other cattle; 118,889 sheep; and 628,198 swine. Barnwell co. raised the most Indian corn, 607,610 bushels; Edgefield the most oats, 415,243; Abbeville the most wheat, 107,608; Colleton the most rice, 11,136,056 lbs.; Edgefield the most cotton, 35,894 bales; and Marion the most sweet potatoes, 187,103 bushels. The U. S. official estimate of acreage, product, and value of the leading crops for 1902 showed the following for S. C.: Indian corn, 1,825,837 acres, 18,988,705 bushels, \$13,102,206 value; wheat, 267,673 acres, 1,498,969 bushels, \$1,528,948; oats, 216,541 acres, 2,836,687 bushels, \$1,673,645; rye, 4,227 acres, 132,125 bushels, \$36,301; potatoes, 8,470 acres, 584,430 bushels, \$56,053; hay, 61,938 acres, 75,564 tons, \$850,095; tobacco, 34,912 acres, 25,625,408 pounds. The cotton production of 1902 was 948,200 commercial bales, and the tobacco crop produced 25,625,408 pounds, valued at more than \$3,000,000. In 1900 there were reported 155,355 farms, covering 13,985,014 acres, of which 5,775,741 acres were improved and 8,209,273 unimproved, and all farm property, including buildings, implements, and machinery, and live stock, was valued at \$153,591,159.

Manufactures.—S. C. had (1880) 2,078 manufacturing establishments, employing 22,328 hands, using capital \$11,205,894, and materials \$9,885,538, paying wages \$2,836,289, and yielding products valued at \$16,738,008. The chief industry according to capital employed was the manufacture of fertilizers, which had 28 establishments, employed capital \$3,493,300, paid wages \$576,580, used materials \$1,297,204, and received \$2,691,053 for products. Next were cotton goods, 14 establishments, \$2,776,100 capital, \$380,844 wages, \$1,808,300 materials, and \$2,895,769 products. Then followed flour and grist-mill products, 720 establishments, \$1,339,269 capital, \$139,352 wages, \$3,265,485 materials, \$3,779,470 products. In 1900 there were in S. C. 3,762 manufacturing establishments, employing \$67,356,465 in capital and \$48,135 persons, paying \$9,455,900 for wages and \$34,027,795 for materials used, and yielding products valued at \$58,248,731, and the chief industries, according to the value of the products, were cotton goods and the manufacture of fertilizers. The principal mineral resource of the state is the almost inexhaustible quantity of phosphate rock, from which is obtained phosphate of lime, used in manufacturing commercial fertilizers. Beds of this rock underlie a region of coast 30 m. wide and 70 long, are found in many rivers flowing to the ocean, and in the streams that pass around the sea-islands, and crop out of the land on interior hills and in the depths of the swamps. River rock is mined by dredging; land rock by pick and shovel. The rock is found at a depth of 1-10 ft. below the surface of the ground, and ranges in thickness from a few inches to 3 ft. In 1890 there

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were 26 mining concerns at work, using a capital of \$8,000,000, and obtaining an annual average output of 600,000 tons of rock, worth \$3,600,000. The river mines yielded 237,150 tons of rock, an increase of more than 25,000 tons over any previous year, on which a royalty of \$1 per ton was paid to the state. There were also 19 manufacturing establishments engaged in making fertilizers from the rock. These employed a capital of \$5,000,000, and produced annually about 400,000 tons of acid phosphate, one-half of which was sold before manipulation, worth about \$2,300,000; the other half was made into ammoniated fertilizers, worth about \$6,400,000. The legislature 1890-1 passed an act providing for appointment of a commission to take charge of the phosphate mining industry, and authorizing the collection from all miners of a royalty of \$2 per ton on all rock mined. In 1890 S. C. had 44 cotton-mills with 317,730 spindles and 10,687 looms, against 14 mills, 82,334 spindles, and 1,676 looms 1880. The largest mills in the south, those with over 20,000 spindles, were at Clifton, Piedmont, Pelzer, Graniteville, Spartanburgh, Charleston, and Pacolet, all in S. C. There were 30 cottonseed oil mills with aggregate crushing capacity of 1,000 tons of seed per day, beside which there were 9 large mills in Ga., and N. C., using S. C. seed, and having a crushing capacity of about 800 tons per day. There were in 1900 22 estab. manufacturing fertilizers, with cap. of \$10,505,043; the value of output being \$4,882,506. The lumber and timber mills numbered 729; cap. \$5,187,727; val. products \$5,207,184. Cottonseed oil and coke employed 50 establishments with cap. of \$1,959,872; val. products \$3,103,425. Cotton goods were made by 80 establishments, with cap. of \$39,258,946; hands 30,201; val. products \$29,723,919. In 1900-01 charters were obtained for 42 new mills. There were 18 establishments for cleaning and polishing rice and 132 manufacturing turpentine and resin. In 1901 225,189 tons of land phosphate rock were mined and 95,229 of river rock; total val. \$961,840.

Commerce.—S. C. had (1890, June 30) 3 ports of entry, Beaufort, Charleston, and Georgetown. The imports were: Beaufort \$24,354, Charleston \$646,644; and domestic exports Beaufort \$1,140,656, Charleston \$13,788,751, Georgetown \$22,436; total imports \$670,998, domestic exports: \$14,951,843. Of the total imports \$27,276 were dutiable, \$643,637 non-dutiable, \$661,759 imported direct from foreign countries, \$9,239 through exterior ports without appraisement, \$670,998 entered for immediate consumption, \$5,057 came in American steam vessels, \$70,281 in American sailing vessels, \$287,251 in foreign steam vessels, and \$308,409 in foreign sailing vessels. The total entrances were 43 American vessels of 11,141 tons, and 118 foreign vessels of 142,561 tons—total vessels 231, tonnage 153,702; and clearances 43 American vessels of 9,004 tons and 260 foreign vessels of 217,120 tons—total vessels 303, tonnage 226,124. There were 228 vessels of all kinds, of 13,527 tons,

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licensed, enrolled, and registered at the three ports, of which 167 were sailing vessels and 61 steam; and 6 sailing and 2 steam vessels, 236.40 combined net tonnage, were built during the year. The principal exports were sea-island cotton, 2,793 bales, value \$263,620; other cotton, 237,510 bales, \$12,259,194; fertilizers, 214,826 tons, \$1,331,163; rosin, 140,399 barrels. In 1902-03 the imports of merchandise at Charleston had a value of \$2,297,462; at Beaufort \$116,510; exports of merchandise at Charleston amounted to \$4,620,930; at Beaufort \$181,794; at Georgetown \$17,083. From Charleston 104,388 bales cotton were exp., \$4,564,789.

Railroads.—The first railroad in the U. S. that employed American-built locomotives was the South Carolina railroad, built 1830-33. The subsequent increase in mileage has been as follows: (1850) 250; (1860) 973; (1870) 1,139; (1880) 1,403; (1901) 2,963, an increase of 44 m. over the previous year. In 1889 there were 34 railroads in the state, whose property was assessed on a valuation of \$17,243,373, and which paid to the state in taxes \$221,793.

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Religion.—The Bapt. is the strongest denominational body in the state, reporting (1890) 1,492 churches, 850 ministers, 199,862 members, 991 Sunday schools, 6,854 officers and teachers, 62,755 scholars, \$175,970 aggregate contributions, and \$1,105,604 invested in church property. The Meth. Episc., S., ranks second, with about 175 ministers and 46,000 members. The Meth. Episc. reported 5 districts (Beaufort, Charleston, Florence, Greenville, and Orangeburg), 94 travelling and 469 local preachers, 340 churches, 43,032 members, 368 Sunday schools, 2,156 officers and teachers, 24,148 scholars, 69 parsonages, \$320,459 invested in church property, and \$32,645 in parsonages. The Presb. Church in the United States had about 175 churches, 100 ministers, 12,000 members, and large investments in educational institutions. In the Rom. Cath. Church the diocese of Charleston, established 1820, comprised the whole state, and had 1 bp., 15 priests, 22 churches, 5 chapels, 3 academies, 8 schools, 2 asylums, 1 infirmary, 2 religious communities, 7 parochial schools with 13 teachers, several sisters, and 712 pupils, and a Rom. Cath. pop. of 8,000. The state formed a diocese also of the Prot. Episc. Church, which had 1 bp., 46 clergy, 80 parishes and missions, 1,980 families, 8,026 individuals, 4,431 communicants, 342 Sunday-school teachers, 2,510 scholars, \$74,015 contributions, 2 church homes, 1 hospital, and 1 acad.—all in Charleston. The Lutheran Church also had important interests in the state.

Education.—In 1902 there were 18 colleges, 9 professional schools, 1 indus. training school, 28 private secondary institutions, 99 public secondary and high schools. In 1889-1900 there were 3,776 public schools; teachers 4,802; pupils enrolled 98,822; av. attendance, 68,000; val. pub. sch. prop. \$2,893,434. 1887-8 there were

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493,434 children of school age enrolled in the public schools. There were 3,280 public school buildings; 2,242 male and 1,961 female (4,203) teachers; receipts: state taxes \$410,338, local \$43,974, other sources \$12,308, total excepting money borrowed \$466,620, balance from previous year \$91,613, total available funds \$558,233; expenditures (including \$385,357 for teachers' salaries) \$430,669; value of school buildings \$435,455. In 1890 there were 707 public school districts; 3,948 public schools; 3,155 school buildings owned and 126 (3,281) rented; 201,260 children enrolled in the schools; 147,799 in average attendance; 4,364 teachers; school buildings valued at \$487,252; value of school buildings under construction \$50,000. The Winthrop Training School for Teachers, at Columbia (founded 1886), had (1887-8) 5 teachers, 17 pupils, and 22 graduates since opening. The school and the state have each offered one scholarship of free tuition to each of the 35 counties. There were 3 private normal schools: Avery Normal Institute, at Charleston (founded 1865), which had 6 teachers, 307 pupils, and \$25,000 in grounds and buildings; Brewer Normal School, Greenwood (1871), 2 teachers, 186 pupils, \$5,000 in grounds and buildings; and the Schofield Normal and Industrial Institute, Aiken (1868), 5 teachers, 347 pupils, \$25,000 in grounds and buildings. The institutions for private secondary instruction were for girls: Female College, Reidsville (Presb.), opened 1857, 4 teachers and 39 pupils; Female Institute, Sumter (Presb.), 1867, 10 teachers, 132 pupils, \$10,000 in grounds and buildings; for boys: High School, Charleston, 1839, 7 teachers, 175 pupils, \$15,000 in grounds and buildings; University School, Charleston, 1882, 2 teachers and 43 pupils; High School, Summerville, 1880, 2 teachers, 40 pupils; and Male High School, Williamston, 1887, 1 teacher, 42 pupils; for both sexes: Wallingford Acad., Charleston (Presb.), 1868, 7 teachers, 670 pupils, \$13,500 in grounds and buildings; Clinton Presb. College, 1872, 6 teachers, 94 pupils, \$8,000 in grounds and buildings; Penn School, Frogmore (non-sect.), 1862, 9 teachers, 235 pupils; Grove School, Grove (non-sect.), 1880, 1 teacher, 46 pupils; and the Sheridan Classical School, Orangeburg, 1878, 4 teachers, 121 pupils, and \$5,000 in grounds and buildings. For superior instruction of women there were: Female College, Columbia (Meth. Episc., S.), 1854, 13 instructors, 140 students, \$50,000 in grounds and buildings; Female College, Due West (non-sect.), 1859, 10 instructors, 146 students, \$14,000 in grounds and buildings; Female College, Greenville (Bapt.), 1854, 14 instructors, 227 students, \$25,000 in grounds and buildings; Female College, Walhalla (non-sect.), 1872, 5 instructors, 80 students, \$5,000 in grounds and buildings; and Female Seminary, Anderson, and Female College, Williamston. There were 8 colleges of liberal arts: College of Charleston (non-sect.), 1785, 5 instructors, 32 students, 10,000 vols. in library, \$20,000 in grounds and buildings,

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\$249,400 in productive funds, \$14,000 income, H. S. Shepherd, LL.D., pres.; Allen Univ., Columbia (African Meth. Episc.), 1881, 6 instructors, 210 students, \$20,000 in grounds and buildings, \$1,391 income, J. W. Morris, pres.; South Carolina College, Columbia (non-sect.), 1801, 16 instructors, 149 students, 27,000 vols. in library, \$100,000 in scientific apparatus, \$325,000 in grounds and buildings, \$95,750 in productive funds, \$48,550 income, John M. McBryde, PH.D., LL.D., pres.; Erskine College, Due West (Assoc. Ref. Presb.), 1841, 6 instructors, 83 students, \$30,000 in grounds and buildings, \$74,000 in productive funds, \$5,200 income, the Rev. W. W. Greer, D.D., pres.; Furman Univ., Greenville (Bapt.), 1850, 7 instructors, 122 students, \$50,000 in grounds and buildings, \$35,000 in productive funds, \$6,500 income, the Rev. Charles Manly, D.D., pres.; Newberry College, Newberry (Luth.), 1856, 6 instructors, 101 students, 6,100 vols. in library, \$6,000 in scientific apparatus, \$25,000 in grounds and buildings, \$22,000 in productive funds, \$4,850 income, the Rev. G. W. Holland, PH.D., LL.D., pres.; Wofford College, Spartanburgh (Meth. Episc., S.), 1851, 9 instructors, 133 students, 5,000 vols. in library, \$50,000 in grounds and buildings, \$50,000 in productive funds, James H. Carlisle, LL.D., pres.; and Adger College, Walhalla (Presb.), 1877, 4 instructors, 88 students, \$10,000 in grounds and buildings, \$10,000 productive funds, Del Kemper, president. There were two schools of science: Claflin Univ. and South Carolina Agricultural College and Mechanics' Institute, Orangeburg (endowed with the national land grant), 1872, 11 instructors, 197 students, \$60,000 in grounds and buildings, \$20,000 income, the Rev. L. M. Dunton, D.D., pres.; and South Carolina Milit. Acad., Charleston (maintained by the state), 1842, 7 instructors, 131 students, \$250,000 in grounds and buildings, \$36,000 income, Gen. George D. Johnston, pres. The schools of theol. were: Benedict Institute, Columbia (Bapt.); Theol. Dept. of Allen Univ., Columbia (African Meth. Episc.); Theol. Seminary of the Gen. Assembly of the Presb. Church in the United States, Columbia; Associate Ref. Theol. Seminary, Due West (Assoc. Ref. Presb.); and Theol. Seminary of the South, Newberry (Luth.); schools of law: Law Dept. of Allen Univ., and School of Law of South Carolina College; and school of medicine: Medical College of South Carolina, Charleston.

By a state report 1895, the total enrolment of the public schools was 223,021—whites 103,729, colored 119,292; total average attendance 159,254—whites 74,359, colored 84,895; new schoolhouses built during the year 99; number of schoolhouses in the state for whites 2,421, for colored 1,631; total number of teachers employed, 4,565—white teachers 2,696, colored 1,869; total amount paid to teachers during the year \$447,810; total expenditures for school purposes \$563,743.

In 1887 South Carolina College was reorganized, and with Claflin Univ. as a branch was constituted the

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Univ. of South Carolina. The new institution started with a college of liberal arts and science, a college of agriculture and mechanic arts, a college of pharmacy, a normal school, a law school, 42 advanced courses in its graduate dept., 148 courses in all depts., 21 lecture rooms, 14 laboratories. and 27 rooms used as shops, draughting-rooms, halls, and for other purposes. During that school-year there were 16 professors and instructors; 136 students in the undergraduate dept., 13 in the graduate, and 21 in the professional; 6 state scholarships; 27,000 vols. in the library; \$425,000 in grounds, buildings, and apparatus; \$95,750 in productive funds; and \$48,550 income. In 1889 the legislature chartered the Clemson Agricultural and Mechanical College, founded on a bequest by Mr. Clemson of the Fort Hill farm of more than 800 acres (former residence of John C. Calhoun, post-office Pendleton), and cash and securities aggregating nearly \$75,000. The institution has been made a U. S. agricultural experiment station, and some departments are now in operations. The legislature 1890 transferred the agricultural dept. of the State Univ. to the Clemson Agricultural College, thus confining the work of the former to liberal studies. The principal charitable institutions of the state are the South Carolina Institution for the Education of the Deaf, Dumb, and the Blind, founded at Cedar Springs 1849; and the state lunatic asylum. Besides those in schools and colleges there were (1886) the following libraries (10): South Carolina State, Columbia, 36,000 vols.; South Carolina Supreme Court, Columbia, 5,000; Medical Soc. of South Carolina (est. 1789), Charleston, 4,500; Prot. Episc. Soc. for the Adv. of Christianity, Charleston, 1,800 vols. and 3,000 pamphlets; Y. M. C. A., Charleston, 1,000; Winyaw Indigo Soc., Georgetown (1757), 2,500; Charleston Library Soc. (1748), 18,512; Florence Library, Florence, 2,000; Edward L. Pierce Library, Frogmore, 1,000; and the Kennedy Library, Spartanburgh, 1,600—total vols. 74,912. In 1902 there were 131 publications in S. C., of which 10 were daily, 12 semi-weekly, 98 weekly, 2 semi-monthly, 7 monthly, and 2 bi-monthly.

Illiteracy.—By the census of 1900 there were 99,156 illiterate males of voting age, all but 3,104 being native born, and all but 15,505 being colored.

Finances and Banking.—In 1880 S. C. had a net state debt of \$6,639,171; co. debt \$1,573,859; city and town \$5,132,908—total \$13,345,938; assessed valuation of real and personal property \$133,560,135; taxation \$1,839,983. In 1890 the net state debt was \$6,992,919 less \$559,360 invalid bonds and stocks, or \$6,433,559; total receipts \$1,129,893; total expenditures \$1,112,092; amount raised by taxation \$723,151; tax rate 52.5 cts. on \$100; assessed valuation real property \$88,113,453, personal \$44,069,185—total \$130,088,552. The aggregate co. debt was \$1,141,550, all excepting \$23,900 of which was bonded, and nearly half the counties were free from debt. The state

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expenditures included: interest on debt \$382,229. On 1903, Jan. 1, the total bonded debt was \$6,514,674, and the sinking fund \$67,430. The total assessed val. was (1902) \$192,357,582, of which \$105,552,392 was real, \$59,139,290 personal, and \$27,665,900 railroad property. The tax rate was \$5 per \$1,000. There were on 1902, Oct. 31, 18 nat. banks in operation, with \$2,060,500 cap. and \$705,419 surplus; 100 state banks (cap. \$4,692,314), and 15 private banks (cap. \$240,000).

History.—The earliest settlement of what is now S. C. was made 1562 by a party of French Huguenots under Jean Ribault (q.v.), who, after discoveries in Fla., landed and erected a fort on an island in Port Royal Harbor, to which he gave the name Carolina in honor of Charles IX. of France. This settlement was short lived, and no further attempts were made to colonize for more than 100 years. In 1663 Charles II. of England created the province of Carolina, of what is now the states of N. C. and S. C., and seven years afterward the English made the first permanent settlement on the Ashley river, removing 1680 to the site of Charleston.

In 1685 French Huguenots made a second and successful settlement, and by emigration from Switzerland, Germany, and Ireland, the colonists increased rapidly in numbers. The early govt. was of the proprietary form, and till 1729 the people lived under a quaint constitution prepared by John Locke (q.v.). Joseph West was the first nominal gov. of the lower part of the province (S. C.), appointed 1674. Like their fellow-colonists in the n. provinces, those of Carolina were subjected to various troubles from the Indians. They had their first Indian war 1680, and were victorious. Gov. West sold many Indian prisoners as slaves to W. India planters, and for so doing was removed 1683. An attempt to enforce the collection of quit-rents led to insurrections and the deposition of Gov. Colleton 1687. Shortly afterward a sea-captain from Madagascar gave the gov. a bag of seed rice, which, distributed and sown, was the beginning of the rice industry in the south. In 1702 Gov. Moore made an unsuccessful attempt to capture St. Augustine (held by Spain), and the province issued its paper money to pay the expenses of the campaign. In 1706 the Carolinians repulsed a French fleet at Charleston; 1715 they defeated the Indians in a severe battle, and drove them into Fla.; 1718 or 19 expelled the gov. and organized an independent govt.; and 1720 they became amenable to the crown by the act of parliament purchasing the proprietors' rights for \$80,000. From that time till the dawning of the revolution the colony greatly prospered. In 1774 a provincial congress was called to act on the oppressive measures of Great Britain, and to choose delegates to the continental congress of 1774-5; and 1775, Sep., the royal gov. fled, and the provincial congress assumed all powers not conflicting with those of the continental body. During the war the severe battles of Fort Moultrie, Charles-

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ton, Camden, King's Mountain, Cowpens, and Eutaw Springs, beside minor engagements, were fought in S. C., the battle of Eutaw Springs being the last important one of the war. The first state constitution was adopted 1776, Mar. 26; the federal constitution was ratified 1788, May 28; and the first permanent constitution was adopted 1790, June 3. In 1832-3 an attempt was made to nullify acts of congress imposing a tariff (see NULLIFICATION OF UNITED STATES LAWS). S. C. was the first of the southern states to take action for dissolution of the Union, and the first to engage in open hostilities against the federal govt. 1860, Oct. 25, the state resolved to secede from the Union if Abraham Lincoln was elected president; Nov. 7 the legislature passed an act calling a state convention, which, Dec. 20, unanimously adopted an ordinance of secession; Dec. 24 the gov. proclaimed the dissolution of the union between S. C. and the other states; Dec. 27, state officers seized Fort Moultrie and Castle Pinckney; and 1861, Apr. 12, 13, Fort Sumter was bombarded and captured by Gen. Beauregard. From this act till the close of the war the state suffered severely. The federal govt. took possession of Port Royal Harbor and Beaufort 1861, Nov.; closely blockaded Charleston harbor; made an unsuccessful naval attack on Fort Sumter 1863, Apr.; besieged and demolished Forts Sumter and Wagner Sep. 7 following; and occupied Columbia and Charleston 1865, Feb. 17. Reconstructive action was at once taken. A provisional gov. was appointed June 30; a state convention repealed the ordinance of secession and declared slavery abolished Sep. 13; a general election for state officers was held Oct. 18; a milit. govt. provided by congress was installed 1867; a convention adopted a new constitution which was ratified by the people; and the state was readmitted into the Union 1868, July 13.

Government.—The executive authority is vested by the constitution of 1868 and subsequent amendments in a gov. elected for 2 yrs., salary \$3,000 per annum, and a lieut. gov. similarly chosen, salary \$1,000 per annum. The lieut. gov. is ex-officio pres. of the senate. In case of the death, removal, or disability of the gov., the lieut. gov. succeeds to the office; and in case of the death, removal, or disability of the lieut. gov., the pres. of the senate, or in case of his disability the speaker of the house, succeeds to the office till the disability is removed or till the next general election. The legislative authority is vested in a general assembly, comprising a senate of 36 members (1 from each co. excepting Charleston, which has 2), elected for 4 years, and a house of representatives of 124 members, elected for 2 years, salary of each \$5 per day and 10 cts. mileage. The judicial authority is represented by a supreme court, 8 circuit courts (common pleas and general sessions), probate courts, justices of the peace, and such other municipal and inferior courts as the legislature may establish. Supreme court judges hold office for 6 years;

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salary, chief justice \$4,000 per annum, 2 assoc. justices \$3,500; 8 circuit and probate judges for 2 years, salary \$3,500; justices of the peace for 2 years. The sec. of state, comptroller-gen., atty.gen., state treas., and supt. of education receive \$2,100 each per annum; adjt. and inspector-gen. \$1,500; supt. penitentiary \$2,100; supt. lunatic asylum \$3,000; state reporter \$1,000; clerk supreme court \$1,000; U. S. dist. judge \$3,500; and U. S. collector of internal revenue \$3,250. There were (1901) Jan. 1 1,435 post-offices in S. C., of which 1 was first-class, 5 second-class, 3 third-class, 1,399 fourth-class, 36 presidential, and 284 money-order offices.

The successive govts., with their terms of service, are as follows: Charles Pinckney 1789-92; Arnoldus Vanderhorst 1792-94; William Moultrie 1794-96; Charles Pinckney 1796-98; Edward Rutledge 1798-1800; John Drayton (actg.) 1800-2; James B. Richardson 1802-4; Paul Hamilton 1804-6; Charles Pinckney 1806-8; John Drayton 1808-10; Henry Middleton 1810-12; Joseph Alston 1812-14; David R. Williams 1814-16; Andrew Pickens 1816-18; John Geddes 1818-20; Thomas Bennett 1820-22; John L. Wilson 1822-24; Richard J. Manning 1824-26; John Taylor 1826-28; Stephen D. Miller 1828-30; James Hamilton 1830-32; Robert Y. Hayne 1832-34; George McDuffie 1834-36; Pierce M. Butler 1836-38; Patrick Noble 1838-40; B. K. Hennegan (actg.) 1840; John P. Richardson 1840-42; James H. Hammond 1842-44; William Aiken 1844-46; David Johnson 1846-48; W. B. Seabrook 1848-50; John H. Means 1850-52; John L. Manning 1852-54; James H. Adams 1854-56; Robert F. W. Alston 1856-58; William H. Gist 1858-60; Francis W. Pickens 1860-62; M. L. Bonham 1862-64; A. G. Magrath 1864-5; B. F. Ferry (provisional) 1865; James L. Orr 1865-68; Robert K. Scott 1868-72; Franklin J. Moses, Jr., 1872-75; Daniel H. Chamberlain 1875-77; Wade Hampton 1877-8; W. D. Simpson 1878-80; Johnson Hagood 1880-82; Hugh S. Thompson 1882-86; John C. Sheppard (actg.) 1886; John P. Richardson 1886-90; Benjamin R. Tillman 1890-94; John Gary Evans 1894-97; William H. Ellerbe 1897-98; M. B. McSweeney 1898-1903; D. C. Heyward 1903-05.

Counties, Cities and Towns.—S. C. is divided into 40 counties. In 1880 the most populous counties were: Berkeley 51,633; Charleston 51,167; Edgefield 45,844; Orangeburg 41,395; Abbeville 40,815; Spartanburgh 40,409; Barnwell 39,857; Greenville 37,496; Sumter 37,037; Colleton 36,386; Anderson 33,612; York 30,713; Beaufort 30,176; Richland 28,573; Aiken 28,112; Fairfield 27,765; and Newberry 26,497; cities and towns: Charleston 49,984; Columbia 10,036; Greenville 6,160; Spartanburgh 3,253; Beaufort 2,549; and Sumter 2,011. In 1900 the most populous counties were: Charleston 88,006; Spartanburgh 65,500; Orangeburg, 57,663; Anderson 55,720; Greenville 53,490; Sumter 51,237; Richland 45,539; York 41,684; and Aiken 39,032; the most populous cities and towns: Charleston 55,807; Columbia

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21,108; Greenville 11,860; Spartanburgh 11,395; Sumter 5,673; Anderson 5,498; Rock Hill 5,485; Union 5,400; Greenwood 4,824; and Florence 4,647.

Politics.—State, congressional and presidential elections are held on Tuesday after the first Monday in Nov. The legislature meets annually on second Tuesday in Jan.; no limit of session; paupers, insane, and persons convicted of treason, murder, or other infamous crime, or duelling, are excluded from voting. The state govt. (1902) was democratic, with a majority of 41 in senate, 123 in house, and 164 on joint ballot. S. C. has 9 electoral votes. For the presidential vote, see PRESIDENT AND VICE-PRESIDENT, ELECTION OF.

Population.—(1790) white 140,178, free colored 1,801, slaves 107,094, total 249,073; (1800) white 196,255, free colored 3,185, slaves 146,151, total 345,591; (1810) white 214,196, free colored 4,554, slaves 196,365, total 415,115; (1820) white 237,440, free colored 6,826, slaves 258,475, total 502,741; (1830) white 257,863, free colored 7,921, slaves 315,401, total 581,185; (1840) white 259,084, free colored 8,276, slaves 327,038, total 594,398; (1850) white 274,563, free colored 8,960, slaves 384,984, total 668,507; (1860) white 291,300, free colored 9,914, slaves 402,406, total 703,708; (1870) white 289,667, colored 415,814, total 705,606; (1880) white 391,105, colored 604,472, total 995,577; (1890) white 462,008, colored 689,141, total 1,151,149. (1900) 1,340,316.

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SOUTH CAROLINA LIQUOR DISPENSARY LAW:
law to regulate the liquor traffic by restricting sales to dispensaries controlled by the state. The provisions of the law, which took effect 1893, July 1, are as follows:

A dispensary for the sale of intoxicating liquors may be opened in the county-seat of each county in the state, on petition of a majority of the freehold voters thereof; Charleston being allowed 10 and Columbia 3 dispensaries; the dispenser to be appointed by a state board of control, which is itself appointed by the governor, and to be a person of good moral character and a total abstainer; the dispenser to purchase all liquors from the state board of control, and in sealed packages which are not to be opened by himself or by any one else on the premises where sold; the packages to contain from one half-pint to five gallons; the dispenser to receive a fixed salary wholly independent of the amount of his sales, and all profits (which are not to exceed 50 per cent.) to be turned in for public uses. The state board of control made a special rule that no liquors should be sold between sunset and sunrise. In 1894 armed resistance to the law at Florence and Darlington made it necessary to call out the state militia. On Apr. 19 of the same year the state supreme court declared the law unconstitutional, except as forbidding the sale of liquor by private parties. All dispensaries were then closed. But on a legal technicality they were reopened July 23; during the intervening three months no attempt was made to enforce the provision forbidding the sale of liquor by private individuals. The decision was afterward reversed, and the constitutional convention of 1895 expressly legalized the dispensary system.

Gov. Tillman claimed in behalf of the system in his message of 1893 (Dec.) that it eliminated the element of personal profit, and hence removed all incentive to increase the sales; that the state guaranteed honest measure and pure liquor; that by forbidding night sales and preventing drinking on the premises, treating, etc., temptations to intemperance were removed; that gambling resorts and disorderly houses lost patronage when no longer allowed to sell liquor by the drink; and, finally, that 'local whiskey rings were torn up root and branch.' At the start the system turned into the treasury about \$100,000 annually. In 1902 all the candidates for gov. were pledged to the support and strict enforcement of the law. The total net profits for the year ending Nov. 30 from the sale of liquor and beer were \$566,897.83; net profit to the state \$123,699.07.

In 1897, May 31, Judge Simonton of the U. S. circuit court decided that the dispensary law, in as far as it forbids the importation of liquors from other states and their sale in original packages in S. C., is invalid as conflicting with the U. S. interstate commerce law: since the state by its own action recognizes intoxicants as legitimate objects of traffic, it cannot create for itself a monopoly of that traffic to the prejudice of dealers of other states.

SOUTH CHESTER—SOUTHCOTT.

SOUTH CHESTER: borough, Delaware co., Penn. It forms a southern suburb of Chester, and is on the Philadelphia Wilmington and Baltimore r.r.; it has numerous manufactories of cotton and woolen goods, a rolling-mill, 5 churches, etc., and there is a steamboat landing on the Delaware. Pop. (1880) 3,664; (1890) 7,076.

SOUTHCOTT, *sowth'kot*, **JOANNA**: curious specimen of the religious visionary: about 1750-1814, Oct. 29; b. in Devonshire, England; of humble parentage. In her youth she was a domestic servant, chiefly in Exeter; joined the Methodists, and becoming acquainted with a man named Sanderson, who claimed the spirit of prophecy, made similar pretensions herself, and received encouragement from some weak-minded clergymen of the Church of England. She was very illiterate. In 1792 she declared herself the woman driven into the wilderness, the subject of the prophecy in Rev. xii. She gave forth predictions in prose and doggerel, and many letters and pamphlets; these were published, and found many purchasers. She also issued sealed papers to her followers, which she termed her *seals*, and which were to protect them from the judgments of God in this life and hereafter. Among the thousands who received these with implicit confidence were men of good education and respectable position. At length she imagined herself to have symptoms of pregnancy, and announced that she was to give birth 1814, Oct. 19, at midnight, to a second Shiloh, or Prince of Peace, miraculously conceived, she being then more than 60 years of age. The infatuation of her followers was such that they received this announcement with devout reverence; provided an expensive cradle, and made other preparations. The expected birth did not take place, but, Dec. 27, the woman died. A post-mortem examination showed that the appearance of pregnancy was due to dropsy. She was privately buried in London. Her followers—said to have numbered more than 100,000—clung to their absurd belief, and expected her to rise again from her 'trance,' and appear as the mother of the promised Shiloh. In 1851, according to the census returns, there were still four congregations of Southcottians in England; later census returns afford no information on this class of subjects; but the sect was not extinct 1860.—Probably the secret of this poor creature's influence lay in the fact that she was in earnest about her own delusions. The multitude of people in the world are lacking in earnest and absolute conviction; thus are always liable to be enslaved by those who are possessed by convictions, however grotesque.

SOUTH DAKOTA.

SOUTH DAKOTA, *da-kō'ta*: state; one of the United States of America; 40th in order of admission into the Union, 27th under the federal constitution; created a state from the part of the terr. of Dakota s. of the 7th standard parallel; admitted by presidential proclamation 1889, Nov. 2.

Location and Area.—S. D. is in lat. $42^{\circ} 40'$ — 46° n., long. 96° — 105° w.; bounded n. by N. D., e. by Minn. and Io., s. by Neb., w. by Mont. and Wyo.; extreme breadth n. to s. 225 m.; extreme length e. to w. 360 m.; 76,620 sq. m. (49,036,800 acres); cap. Pierre.

Topography.—In general the face of the country is like that of N. D. (q.v.); but w. of the Missouri river the level and rolling portions rise to numerous hills and buttes, and terminate in the rugged, elevated, mineralogically rich Black Hills, of which region 3,200–4,000 sq. m. are in S. D., and the smaller portion in Wyo. The state is divided into the Missouri, Big Sioux, James, and Central Dakota valleys, and the Sioux Reservation and Black Hills regions. The Missouri valley contains the greater part of the alluvial or 'bottom' lands, and is the corn belt of the state. The river flows through the state from about the centre of the n. boundary to the extreme s.e. corner, forms the s. boundary for about 200 m., and is navigable for steamboats 8 months in the year. The Big Sioux valley lies in the e. and s.e. parts of the state, and, while it has excellent agricultural lands, is particularly rich in quarries of granite and many-colored jasper. The river rises near Watertown, in Kampeska co., drains many lakes and large ponds, forms a part of the boundary between S. D. and Io., and empties into the Missouri in the s.e. corner. The James river valley is a fertile prairie nearly 400 m. long, extending through S. D. and into N. D., contains numerous artesian wells, and is highly adapted to stock-raising. The Central Dakota valley comprises a large tract on both sides of the Missouri river, and is adapted to general grain and stock farming. The Sioux Reservation region embraces all the territory w. of the Missouri river and e. of the Black Hills, extending from the s. to the n. boundaries of the state, and thence to Bismarck, in N. D., and comprises 11,000,000 acres in S. D., which were bought by the federal govt. from the Indians for \$14,000,000, and thrown open to settlement 1890, Feb. 10. This region contains the Cheyenne, White, Grand, and Moreau rivers, each with several tributaries, and its acquisition by the govt. made possible a long-needed extension of railroad facilities. The Black Hills region is the s.w. division of the state, and is noted for the richness, abundance, and diversity of its mineral resources, which were practically unknown prior to 1874.

Climate.—The records of the various U. S. signal-offices in the state show the following annual average temperature for 15 years: at Yankton, in the s., $45^{\circ} 5'$; Deadwood, in the w., $42^{\circ} 1'$; Huron, central from n. to s., $41^{\circ} 8'$; average temperature in coldest month (Jan.)

SOUTH DAKOTA.

at Yankton $14^{\circ} 1'$; Deadwood 21° ; highest in state 1890. 56° , lowest= 28° ; average annual rainfall Yankton 28.43 in., Deadwood 28.23, Huron 23.65. The winter seasons are cold, but the air is clear and devoid of humidity. There is no rain in winter, and while the snow lies crisp and hard, the falls do not aggregate as much in inches as in the e. states. Spring opens early; farming operations generally begin late in Mar. or early in Apr., and plowing continues till late in Nov. In summer the days are warm and the nights cool and invigorating. Oct. is the most delightful month. The climate through the year is beneficial to sufferers from pulmonary, bronchial, and malarial diseases.

Geology.—The finest geological formations in the state are in the Black Hills region. Following the granite at Harney Peak are archæan slates and schists, then Potsdam sandstone and cement, next carboniferous limestones, after them the Jura-Triassic formation (red beds), then the cretaceous sandstones, and lastly coal measures, oil veins, and salt rock. The economic properties are gold, silver, tin, copper, and mica in the slates and schists; gold, silver, and copper in the Potsdam sandstone; building stone in great variety, lime, and marbles in the carboniferous limestones; variegated sandstone and gypsum in the 'red beds'; and building stones, whetstones, and grindstones in the cretaceous sandstone. Tin was discovered in the Hills 1877, began to be worked 1883, and more than 4,000 veins had been discovered, located, and recorded 1891.

Agriculture.—The soil in general is a fine alluvial loam, 1-4 ft. deep, underlaid with clay, of a grayish brown color, everywhere easily worked, and adapted particularly to cereals and grasses. An official report on the acreage and yield of the principal farm crops in 1889 showed: wheat, 2,013,726 acres, 17,287,332 bushels; oats, 671,828 acres, 11,623,615 bushels; corn, 784,655 acres, 21,821,898 bushels; barley, 127,338 acres, 1,694,875 bushels; rye, 16,587 acres, 255,620 bushels; buckwheat, 2,828 acres, 29,667 bushels; potatoes, 29,537 acres, 2,637,132 bushels; and flax, 345,803 acres, 2,754,376 bushels. Official estimates for 1902 gave: wheat 3,604,347 acres, 43,973,033 bushels; corn, 1,577,398 acres, 29,812,822 bushels; oats, 692,553 acres, 24,100,844 bushels; rye, 37,726 acres, 690,499 bushels; barley, 305,745 acres, 8,927,754 bushels; potatoes, 31,801 acres, 2,353,274 bushels; flax, 427,500 acres, 3,206,250 were reported 52,622 farms, covering 19,070,616 acres, of which 11,285,983 were improved and 7,784,633 were unimproved, and all farm property, including buildings, implements and machinery, and live stock, were valued at \$259,456,170.

Manufactures.—As yet, owing to the comparative newness of the country and the large interest in agriculture, S. D. has few manufactures. Excluding mining in the Black Hills, the manufacture of flour and grist-mill products is the largest industry. In 1889 there were 5 mills

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with a capacity of more than 200 barrels per day each, which employed \$300,000 capital, and received \$1,200,000 for products; and 76 mills with capacity of less than 200 bbls. per day. In 1900 there were 120 establishments producing flour and grist, the capital employed being \$1,754,752; the val. of products \$3,379,843; 138 cheese, butter, and condensed milk factories, the value of products being \$1,199,493. Establishments for lumber and timber numbered 29. In 1900 there were 1,639 manufacturing establishments, employing \$7,578,895 capital and 3,121 persons, paying \$1,544,409 for wages, and \$7,827,110 for materials used, and yielding products valued at \$12,231,239.

Railroads.—1890, Nov. 30, S. D. had a total of 2,583 m. of railroad in operation, of which 133 m. were constructed last year. In 1901 there were 3,005 m. of railroads in the state. The roads with more than 100 m. each were the Chicago, Milwaukee and St. Paul; the Chicago and Northwestern; the Great Northern; the Fremont, Elkhorn and Missouri Valley; and the Burlington and Missouri River.

Religion.—In 1890 the Rom. Cath. Church reported diocese of Sioux Falls (established 1889, and comprising the state), 1 bp., 39 priests, 76 churches, 7 academies, 14 parochial schools with 1,223 pupils, 4 Indian missions, 4 convents, and estimated Rom. Cath. pop. 50,000. The Meth. Episc. Church reported 5 districts, 76 travelling and 91 local preachers, 108 churches, 10,441 members, 244 Sunday schools, 1,858 officers and teachers, 11,613 scholars, church property valued at \$296,940, 43 parsonages, value \$30,115, contributions for ministerial support \$60,080, and total contributions \$70,147. The Congl. Churches reported 70 ministers, 127 churches, 4,908 members, 8,696 Sunday-school members, 34 Y. P. S. C. E. with 1,035 members, 106 mission Sunday schools with 3,566 members, 12,262 total Sunday-school membership, contributions for home expenditures \$50,553, and total contributions \$61,153. The Presb. Church reported synod of S. D., 5 presbyteries, 79 ministers, 121 churches, 4,440 members, 6,064 Sunday-school members, contributions for congregational purposes \$31,570, and total contributions \$39,743. The Bapt. Churches reported 5 associations, 1 unassigned body, 60 ministers, 83 churches, 3,766 members, 67 Sunday schools, 511 officers and teachers, 4,372 scholars, church property valued at \$116,575, contributions for salaries and expenses \$24,170, and total contributions \$30,638. Of the churches 60 were American, 16 Scandinavian, and 7 German. The general missionary travelled 13,750 m. during the year, organized 7 churches, dedicated 6 church edifices, and supervised 33 missionaries. The Prot. Episc. Church reported missionary district of S. D., comprising the state and the Santee Indian reservation in Neb., 1 bp., 33 clergy, 77 parishes and missions, 2,492 communicants, 2,045 Sunday-school scholars, contributions \$21,833, St. Paul's School for Boys at Yankton, St. Mary's School for Boys and Girls at Rosebud Reserva-

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tion, St. John's School for Girls at Cheyenne River Agency, and Hope School for Boys and Girls at Springfield.

Education.—The act of congress creating the state provided that two sections of land in each township should be set apart to form by sale or lease a permanent school fund, this fund also to receive 5 per cent. of the proceeds of sales of unappropriated lands in the state by the federal govt. In addition 72 sections of public land were given to the state for univ. purposes; 120,000 acres for agricultural colleges, 40,000 acres each for a School of Mines, Reform School, Deaf and Dumb Asylum, Agricultural College, and State Univ.; 80,000 acres for normal schools; and 170,000 acres for general educational and charitable purposes. In 1889-1900 there were 98,822 children enrolled in the public schools, 2,000 in private schools, and 5,000 in parochial schools. Public schools had aver. daily attendance of children 68,000; number of teachers, 4,802; number of schoolhouses, 3,776. There 6 instructors and 146 students. Private secondary schools were Ward Acad. (Congl.) at Burnside, Augustana Coll. (Luth.) at Canton, Scotland Acad. (Presb.) at Scotland, All Saints' School (Prot. Episc.) at Sioux Falls, Sioux Falls Univ. (Bapt.) at Sioux Falls, St. Martin's Acad. (Rom. Cath.) and Wessinger Springs Seminary (non-sect.) at Wessinger Springs. Universities and colleges are: Pierre Univ., East Pierre (Presb., 1883), which had (1894-5) 7 instructors, 83 students, value of grounds and buildings \$30,000; Wm. M. Blackburn, D.D., LL.D., pres.: Black Hills Coll., Hot Springs (Meth. Episc., 1890), 9 instructors, 101 students, value of grounds and buildings \$54,000; J. W. Haucher, M.S., A.M., pres.: Dakota Univ., Mitchell (Meth. Episc., 1885), 15 instructors, 145 students, value of grounds and buildings \$75,000; W. I. Graham, A.M., pres.: Redfield Coll., Redfield (Congl., 1887), 10 instructors, 94 students, value of grounds and buildings \$30,000; T. P. Patch, pres.: Univ. of S. Dak., Vermilion (non-sect., 1883), 14 instructors, 291 students, value of grounds and buildings \$115,000; Joseph W. Mauck, A.M., pres.: Yankton Coll., Yankton (Congl., 1882), 12 instructors, 241 students, value of grounds and buildings \$130,000; H. K. Warren, pres. The S. Dak. Agricultural Coll., at Brookings, had (1894-5) 24 instructors, 269 students, vols. in library 3,865, value of scientific apparatus and library \$24,500, value of grounds and buildings \$100,000; Lewis McLouth, PH.D., pres. The School of Mines at Rapid City, opened 1887, had 5 instructors, 48 pupils, \$25,000 in grounds and buildings, \$12,000 income, complete working line of minting machinery; Franklin R. Carpenter, PH.D., pres. Normal schools were maintained at Madison, 9 instructors, 300 students; and at Spearfish, 11 instructors, 194 students. In 1890 the legislature abolished the state board of education, created the board of regents of education, and transferred the powers of the old board to the supt. of public instruction.

The charitable and reformatory institutions include

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the State School for Deaf-mutes, at Sioux Falls, opened 1880, with two granite buildings that cost \$53,000; State Hospital for the Insane, at Yankton, with farm of 640 acres and buildings and implements that cost \$239,960; Soldiers' Home, at Hot Springs, opened 1889, Nov., cost of building \$50,000; Penitentiary at Sioux Falls; and a Reform School at Plankinton. In 1902 there were 259 periodicals in the state, of which 16 were daily, 2 semi-weekly, 227 weekly, 2 semi-monthly, 13 monthly, and 1 quarterly. In 1891 there were 265 periodicals.

Finances and Banking.—The receipts of the general fund for the year 1889, Nov. 5—1890, Nov. 30, were \$500,542, legislative appropriations \$443,889.71, special payments \$26,433.43 (total \$470,323.14); state debt, bonded, \$1,200,000. The bonded debt Jan. 1, 1903, was \$381,500; net debt, \$712,500; assessed val. (1902) \$12,738,892. The state had taxes due and unpaid to the amt. of \$700,000. The constitution authorizes the issue of bonds to cover the portion of the terr. debt assumed by the state, and limits the further increase of this indebtedness to \$100,000. A proposed amendment, increasing the limit of indebtedness to \$500,000 beyond existing debts, was defeated 1890. In 1902, June, there were 35 nat. banks (cap. \$1,650,000), 185 state banks (cap. \$2,307,050), 55 private banks (cap. \$359,814), and 2 loan and trust companies (cap. \$85,000).

History.—For the principal events in the history of the state, see DAKOTA and NORTH DAKOTA. To these should be added the sale to and opening by the govt. of one-half of the Sioux Indian reservation, comprising 11,000,000 acres in S. D., and the similar disposition of 500,000 acres comprising the old Sisseton agency, both in 1889; the Indian Messiah craze, uprising of the Sioux, and death of Sitting Bull 1890-1; the action of Judge Aiken of the circuit court in putting an end to the abuse of the state's divorce legislation, by refusing decrees unless satisfied that the petitioners intended to become permanent residents of the state 1891; and the annulling by the legislature of the constitutional prohibition amendment 1891, alluded to below.

Government.—The executive authority is vested by the constitution (1889) in a gov., elected for 2 years, salary \$3,000 per annum; a lieut. gov. elected at the same time and for the same term, compensation double that of a state senator; and sec. of state, state treas., auditor, supt. of public instruction, commissioner of schools and public lands, salary of each \$1,800, and an atty.gen., salary \$1,000. Candidates for gov. and lieut.gov. must be qualified electors of the state, at least 30 years old, and residents of the state or terr. for 2 years next preceding the election. In case of the death, impeachment, resignation, or disability of the gov., the duties of his office devolve on the lieut.gov.; and in case of the disability of the lieut.gov. while acting as gov., the sec. of state becomes chief executive till the vacancy is filled or the disability removed. The legislative authority is

SOUTH DAKOTA.

vested in a senate of not less than 25 nor more than 45 members (45 in 1901), and a house of representatives of not less than 75 nor more than 135 members (85 in 1901). Senators and representatives are elected for 2 years, and receive \$5 per day during the session of the legislature and 10 cts. mileage; sessions biennial; limit of regular sessions 60 days. The judicial authority is vested in a supreme court, circuit courts, co. courts, and justices of the peace, and such other courts as may be created for cities and incorporated towns. The supreme court consists of one judge for each of the 3 districts into which the state was originally divided, and after 5 years from date of admission of the state into the Union, the districts and judges may be increased to not exceeding 5. The term of the judges first elected under the constitution was 4 years, all subsequent terms to be 6 years. Judges select their presiding judge from their number, and the salary of each was fixed at \$2,500 per annum, the legislature being authorized to increase this amount to \$3,000 in or after 1890. The circuit courts were fixed for one in each of 8 judicial circuits, with a judge for each, term 4 years, salary \$2,000. The legislature had authority to increase the salary of a circuit court judge to \$2,500 in or after 1890, and to increase the number of circuits and judges when deemed necessary by two-thirds of its members. The other judicial officers have the usual districts and responsibilities. The constitution contained an article providing for the prohibition of the manufacture and sale of intoxicating liquor, which was submitted to popular vote separately, and adopted 1890. The legislature 1891, Feb. 20, adopted the report of the committee of the whole on the 'Resubmission Bill', to vote to annul the constitutional prohibition amendment. The general features of the constitution of S. D. are similar and in parts identical with those in the constitution of North Dakota (q.v.).

The state is divided into 41 senatorial districts, 37 of which have one senator each and 4 two, and 50 representative districts, with from one to six representatives each. The first state officers, elected 1889, Oct. 1, included: Arthur C. Mellette, gov.; James H. Fletcher, lieut.gov.; Dighton Carson, Alonzo G. Kellam, and John E. Bennett, supreme court judges; and E. G. Smith, F. R. Aikens, J. O. Andrews, Richard Haney, A. W. Campbell, Howard G. Fuller, John W. Nowlin, and Charles M. Thomas, circuit court judges. The first legislature elected Gideon C. Moody and R. F. Pettigrew U. S. senators. The first members of congress were Oscar S. Gifford and John A. Pickler; first U. S. district judge Alonzo J. Edgerton; first U. S. dist.atty. W. B. Sterling; first U. S. marshal Cyrus J. Fry; and first U. S. surveyor-gen. B. H. Sullivan. The state is divided into 63 counties. It has 6 United States land offices; and (1901, December 13), 694 post-offices, of all grades.

SOUTH EASTON.

Counties, Cities, and Towns.—The most populous counties 1900 were: Minnehaha 23,926; Lawrence 17,897; Brown 15,286; Turner 13,175; Yankton 12,649; Brookings 12,561; Day 12,254; Roberts 12,216; Lincoln 12,161; Hutchinson 11,897; Union 11,153; Bon Homme 10,379; Kingsbury 9,866; Spink 9,487; Lake 9,137; Grant 9,103; Coddington 8,770; and McCork 8,689. The principal cities and towns were: Sioux Falls 10,266; Lead 6,210; Yankton 4,125; Aberdeen 4,087; Mitchell 4,053; Deadwood 3,498; Watertown 3,352; Huron 2,793; Madison 2,550; Brookings 2,346; Pierre 2,306; Vermillion 2,183 and Canton City 1,943. There were 4 Indian reservations with aggregate pop. of 16,043.

Politics.—State (biennial), congressional, and presidential elections are held on Tuesday after the first Monday in Nov. The legislature meets on Tuesday after the first Monday in Jan. Persons under guardianship, *non compos mentis*, insane, or convicted of treason or felony (unless restored to civil rights) are excluded from voting; and women qualified by age, residence, and citizenship may vote at elections held solely for school purposes. For the presidential vote, see **PRESIDENT and VICE-PRESIDENT, ELECTIONS OF.**

Population. — (1880) 98,268; (1890) 328,808, increase 230,540; (1900) 401,570.

SOUTH EASTON: formerly a borough in Northampton co., Penn.; now a part of Easton; on the s. bank of the Lehigh river, and on the Lehigh Valley r.r. and the Lehigh canal; opposite Easton, Penn., and Phillipsburg, N. J. It has manufactories of cotton goods and wire, and 4 churches. Pop. (1880) 4,534; (1890) 5,616.

SOUTHEY, *sowth'i* or *sŭth'i*, ROBERT: English poet of minor rank, and prose-writer unsurpassed: 1774, Aug. 12—1843, Mar. 21; b. Bristol; son of a linen-draper. In 1788 he was sent to Westminster School by his maternal uncle, the Rev. Herbert Hill: there he much distinguished himself; but in 1792 a trivial insubordination led to his expulsion; and next year he was entered at Balliol College, Oxford, with a view to his taking orders in the church. This, however, he ultimately declined to do, having been led by sympathy with the French Revolution to depart from the orthodox civil and religious standards. In 1794 he left Oxford, having published the year before, in conjunction with his friend Robert Lovell, a small volume of poems, the first literary venture of a life thenceforward to be devoted to literature. Shortly afterward he received from Cottle £50, for his first poem of any length, *Joan of Arc*. 1795, Nov., he was married to Miss Edith Fricker of Bristol; Coleridge, with whom he had become intimate, on the same day marrying a sister. After passing some time with his uncle, Mr. Hill, who had educated him and was chaplain of the English legation in Portugal—during which visit he diligently studied the language and literature of that country and of Spain—S. became a student of law at Gray's Inn. Here he worked at his new poem of *Madoc*, and learned nothing whatever of law, which pursuit he speedily relinquished. In 1801 he accepted a situation as sec. to the chancellor of the exchequer for Ireland; but the duties were distasteful to him; and he soon quit his situation, and finally betook himself to literature for his livelihood.

In 1804 he settled at Greta Hall, near Keswick in Cumberland, where he spent the remainder of his life, working with the regularity of a machine, happy in his family relations and his unremitting daily round of congenial though continuous toil. His biography thenceforward for 40 years, till the pen dropped from his fingers, might be summarized in the list of his works, which of itself would fill a page or two. In addition to these formal publications, he wrote largely for various periodicals, notably for the *Quarterly Review*, to which, from its establishment in 1809—having now become as violently conservative in his views as in youth he had been revolutionary—he was a constant and valued contributor.

In 1807, in consideration of his services to literature, a pension of £160 per annum was awarded him; and 1813, on the death of Mr. Pye, he succeeded him as poet laureate. Through Sir Robert Peel, 1835, he received a further pension of £300, and with it the offer of a baronetcy, which, however, he had the good sense to decline. His wife, who had been three years an inmate of a lunatic asylum, died 1837; and he was married two years afterward to Miss Caroline Ann Bowles (1786–1854), writer of simple poetry and similar prose. In that year softening of the brain came on, and his last four years were passed mostly in painful mental stupor.

S.'s poetry—except in a few of his shorter ballad-pieces—was never popular, and is now nearly forgotten. His

SOUTH FRAMINGHAM--SOUTH NORWALK.

chief poetic works are *Madoc*, *Thalaba*, *The Curse of Kehama*, and *Don Roderick*; the last two reckoned the best. In all of them are noble passages, in which an ample and stately rhetoric counterfeits with surprising success the pure instinct of music; but they rather skillfully illustrate the art and technic of poetry than breathe its essential life. As a prose writer, he ranks among masters; his style is easy, lucid agreeable, nicely modulated throughout, and readily rising into eloquence on suggestions of sentiment and subject. Of all his multifarious writings, his little *Life of Nelson* seems most likely to survive as a classic: within its assigned limits, it is an almost perfect model of biography. Other excellent biographies are those of the poet Cowper, of Bunyan, and of Wesley. His *Life and Correspondence*, edited by his son, was published in 6 vols. (1849); a *Selection from his Letters* (1856); his *Correspondence with Caroline Bowles* (1881).

SOUTH FRAMINGHAM: see FRAMINGHAM.

SOUTH HADLEY, hăd'li: town in Hampshire co., Mass.; on the Boston and Maine railroad; 2 m. e. of the Connecticut river, 8 m. s.w. of Amherst, 12 m. n. of Springfield. The river, 4 m. s. of the town, has fall of 40-50 ft., around which a canal 2 m. long has been built, affording valuable water-power for important manufactories at the village of South Hadley Falls, and at Holyoke, on the opposite side of the river. S. has 5 churches, high school, lyceum, 1 cotton, 2 woolen, 4 paper, and 4 saw mills; commands a fine view through the gap between Mt. Holyoke and Mt. Tom; and is the seat of Mt. Holyoke Seminary (q.v.). Pop. (1890) 4,261; (1900) 4,526.

SOUTHINGTON, south'ing-ton: town in Hartford co., Conn.; on the Quinepiac river, and on the New York New Haven and Hartford railroad; 17 m. s. w. of Hartford, 20 m. n. of New Haven. It has 4 churches, high school, graded school, acad., 1 national bank (cap. \$100,000), 1 sav. bank, a semi-weekly newspaper; and manufactures general and carriage hardware, pocket cutlery, silver-plated ware, etc. Pop. (1890) 5,501; (1900) 5,890.

SOUTH ISLAND: southern of the two large islands which, with the small Stewart's Island, form the British colony of New Zealand (q.v.).

SOUTH NORWALK: a city in Fairfield co., Conn.; on the Norwalk river, and on the Housatonic and the New York New Haven and Hartford railroads; 2 m. s. of Norwalk, with which it is connected by street railroad; 14 m. w.s.w. of Bridgeport; 42 m. n.e. of New York, with which it has daily steamboat communication. It has 5 churches, opera-house, a milit. institute, ship-yard, iron-works, planing-mill, felt-hat, lock, shoe, paper, and box factories, and large oyster trade. There are 1 national bank (cap. \$100,000), 1 savings bank, and 1 daily and 1 monthly newspaper. Pop. (1890) 6,000; (1900) 6,591.

SOUTHOLD—SOUTHSAY.

SOUTHOLD, *sowth'old*: formerly a village of Suffolk co., N. Y.; 1 m. from Long Island Sound; on the Long Island railroad; 5 m. w.-by-s. of Greenport, 90 m. e.-by-n. of New York. It was settled by a colony from New Haven 1640, Aug. 27. The first church was built and dedicated Oct. 21 following, and houses still remain that were built 1640, 47, 52, and 90. The village contains 4 churches, an acad., flour-mill, fish-oil manufactory, savings bank, and 1 weekly periodical estab. 1871. The place is of romantic and historic interest, is peopled chiefly with descendants of its original settlers, and celebrated its 250th anniversary 1890, Aug. 27. The town includes Greenport vil. Pop. (1890) 7,705; (1900) 8,301.

SOUTH O'MAHA: city in Douglass co., Neb.; on the Union Pacific and the Burlington and Missouri River railroads; 4 m. from Omaha. It was laid out 1884 to accommodate the stock-yard, meat-packing, and rendering interests of Omaha; and 1887 ranked next to Chicago and Kansas City in the combined industry. There were 5 companies engaged in the business, one with a capital of \$2,000,000, and 3 more were about starting. The receipts of live-stock were 229,263 cattle, 1,186,534 hogs, and 76,014 sheep, and the shipments 154,164 cattle, 157,680 hogs, and 50,449 sheep. The packing-house consumption was 75,099 cattle, 1,028,854 hogs, and 19,570 sheep. In 1902 there were 2 daily and 1 weekly newspapers, and 3 national banks (cap. \$700,000). Pop. (1890) 8,062; (1900) 26,001.

SOUTH OR'ANGE: an independent village in Essex co., N. J.; on the Delaware, Lackawanna and Western railroad; 2 m. s.w. of Orange, 5 m. w. of Newark, 15 m. w. of New York. It contains 4 churches; large graded public school, acad., free library, 1 weekly newspaper, and manufactories of flour, hats, and paper. It is connected with Newark and Orange by street railroads, and is an attractive residence place. Seton Hall Col. (Rom. Cath.), founded 1856, which had (1901) 16 professors and instructors, 162 students, and 10,000 vols. in its library, and the Diocesan Seminary of the Immaculate Conception, with 3 prof. and 32 stud., are located here. Pop. (1880) 2,178; (1890) 3,106; (1900) 4,608.

SOUTHPORT, *sowth'pōrt*: fashionable bathing-place in Lancashire, England; on the s. shore of the estuary of the Ribble; 19 m. n. of Liverpool. It is a handsome town, almost wholly of recent erection. There are assembly-rooms, libraries, large hotels, etc.; the sands are good, and there is an iron pier nearly a mile long. S. has risen rapidly in favor as a watering-place, by reason of its salubrity and the beauty of its environs. Pop. (1851) 5,391; (1881) 32,164; (1891) 43,026.

SOUTHSAY, *n. sowth'sā*: OE. for SOOTHSAÿ.

SOUTH SEA SCHEME.

SOUTH SEA SCHEME, THE: commonly designated the **SOUTH SEA BUBBLE**, a term peculiarly expressive of its hollow splendor and sudden collapse: financial scheme in Britain, originated 1711 by Harley (q.v.), Earl of Oxford, to restore public credit, and to provide for extinction of the floating national debt, at that time £10,000,000. This debt was taken up by a number of eminent merchants, to whom the govt. guaranteed for a certain period the annual payment of £600,000 (being 6 per cent. interest), which sum was to be obtained by rendering permanent a number of import duties. Also the monopoly of the trade to the South Seas was secured to these merchants, who were accordingly incorporated as the 'South Sea Company,' and at once rose to a high position in the mercantile world. The extravagant ideas current respecting the riches of the S. American continent were carefully fostered by the company; and a general avidity to partake in the profits of this most lucrative speculation sprang up; though the company's trading projects had no other result than a single voyage of one ship 1717. Notwithstanding this default, the company had obtained popular favor, and its shares rose day by day. Far from being alarmed at the expected and impending failure of a similar project—the Mississippi Scheme (q.v.)—the South Sea Company believed in the feasibility of Law's scheme, and resolved to avoid what they considered as the errors which had caused his downfall. Trusting to the possibility of pushing credit to its utmost extent without danger, they proposed, in the spring of 1720, to take on themselves the whole national debt (then £30,981,712), on being guaranteed 5 per cent. per annum for $7\frac{1}{2}$ years, at the end of which time the debt might be redeemed if the govt. chose, and the interest reduced to 4 per cent. The directors of the Bank of England, jealous of the prospective benefit and influence thus to accrue to the South Sea Company, submitted to government a counter-proposal; but the more dazzling nature of their rival's offer secured its acceptance by parliament—in the commons by 172 to 55, and (Apr. 7) in the lords by 83 to 17—against the protests of a few eminent men. During the passing of their bill, the company's stock rose steadily to 330 on Apr. 7. Till this date, the scheme had been honestly promoted; but now the directors threw aside all scruples, and used all means, honest or dishonest, for giving factitious value to the stock. The shares were quoted at 550 May 28, and 890 June 1. Thinking that the stock had reached its maximum, so many holders rushed to realize, that the price fell to 640 June 3. The directors sent agents to buy up; and on the evening of June 3, 750 was the quoted price. Similar artifices had the effect of ultimately raising the shares to 1,000 in the beginning of Aug., when the chairman of the company and some principal directors sold out. Widespread uneasiness then seized the holders of stock; every one was eager to part with his shares, and Sep. 12 they fell to 400, in spite of all attempts of the directors. The consternation of those who still held their scrip became

SOUTH SHETLANDS—SOUTHWORTH.

extreme; many capitalists absconded, either to avoid ruinous bankruptcy, or to secure their ill-gotten gains; and the government became seriously alarmed at the excited state of public feeling. The Bank refused to come to the rescue. The public excitement reached an alarming pitch; punishment of the fraudulent directors was clamorously demanded; and parliament was hastily summoned (Dec. 8) to deliberate on means of mitigating this great calamity. In an impetuous mood, an examination of the proceedings of the company was begun; and nine millions sterling of South Sea bonds were taken up by the Bank, and a similar amount by the E. India Company. The officials of the company were forbidden to leave the kingdom for 12 months, or to dispose of any of their property or effects. Ultimately, various schemes of the directors, involving deep fraud and villainy, were unearthed; and it was proved that the Earl of Sunderland, the Duchess of Kendal, the Countess Platen, and others in high position, had been bribed to promote the company's bill in parliament by a present of £170,000 of South Sea stock. The total amount of fictitious stock created for this and similar purposes was £1,260,000. Equally flagrant iniquity in high places in the allocation of shares was discovered. Most of the directors were imprisoned, and all suffered confiscation of their possessions. At the end of 1720, it being found that £13,300,000 of real stock belonged to the company, £8,000,000 of this was taken, and divided among the losers, giving them a dividend of 33½ per cent.; and by other schemes of adjustment, the pressure of loss was distributed as fairly and widely as possible. Contemporary with this great gambling scheme were numerous similar 'bubbles,' which added greatly to the general distress, till they were suppressed by act of parliament, 1720, July 12. —See Coxe's *Walpole*, *Bubbler's Medley*, published by Carrington Bowles, Mackay's *Popular Delusions*, and the various histories of England during this period.

SOUTH SHETLANDS, *shĕt'landz*, New: group of islands in the s. Atlantic, about 600 m. s. of Cape Horn; lat. 61°—63° 50' s. They are destitute of vegetation, except a species of moss. The chief are Smith, Livingston, Nelson, King George, Clarence, and Elephant Islands. Ice and snow lie at the sea-level all the year.

SOUTH SHIELDS: see **SHIELDS**, **SOUTH**.

SOUTHWARK: see **LONDON**.

SOUTHWELL: small market-town of considerable antiquity in Notts, England, 12 m. n.e. of Nottingham. At S., Charles I. surrendered himself to the Scotch commissioners. S. has a noble minster, Norman and Early English in style; a church was built here by Paulinus 627. A bishop, for the bishopric founded six years before, was appointed 1884.—Pop.(1881) 2,866; (1891) 2,831.

SOUTHWORTH, *sowth'wĕrth*, EMMA DOROTHY ELIZA (NEVITTE): author: b. Washington, D. C., 1819, Dec. 26. She was married 1840 to Frederick H. S., and taught school in Washington 1844–49. Later she made her home

SOUVALKY—SOW.

in Yonkers, N. Y., and afterward in Georgetown, D. C.; where her death occurred. Her first story, *The Irish Refugee*, appeared in the *Baltimore Saturday Visitor*, and *Retribution* soon followed serially in the *National Era*. For many years by contract with the *New York Ledger* her stories appeared first in that paper. She was a very popular writer, and has published about 60 novels, many of which have been translated into German, French, and Spanish. She died 1899, June 30.

SOUVALKY, *sô-vâl'kî*: chief town of a govt. in Poland, on a tributary of the Niemen, 538 m. s.w. of St. Petersburg. Pop. (1880) 21,040; (1894) 17,519.

SOUVENIR, n. *sô've-nēr* [F. *souvenir*, remembrance—from L. *subvenīrē*, to come into one's mind—from *sub* under; *venīrē*, to come]: a gift of affection; a keepsake; a remembrancer; a memorial.

SOU'WESTER: see **SOUTHWESTER**, under **SOUTH**.

SOUZDAL, *sôz-dâl'*: town of Russia, govt. of Vladimir one of the oldest towns in Russia, dating, it is said, from B.C. 606. Pop. about 9,000.

SOVEREIGN, n. *sôv'ēr-în* [F. *souverain*; OF. *soverain*—from mid. L. *superānus*, chief, principal—from L. *super*, above: It. *sovrano*, uppermost, supreme]: an emperor; a king; a monarch; a supreme ruler; the person or body of persons in whom the legislative power of a state is vested. In limited monarchies, sovereignty is in a qualified sense ascribed to the monarch, who, though the supreme magistrate, is not sole legislator. **SOVEREIGN**, a. supreme in power; efficacious; effectual; chief; paramount; having no superior. **SOV'EREIGNTY**, n. -*tî*, supreme power; highest place. **SOVEREIGN STATE**, a country or state which administers its own government, and in which the legislative power is not trammelled by any other power—or, as in the states of the American Union, by any *foreign* power. The states of the German empire were designated *mi-souveraines*, because their sovereignty was qualified by their subjection to the imperial authority.

SOV'EREIGN: English gold coin of the value of 20 shillings sterling; standard weight 123.374 grains troy. The name was applied first to a gold coin issued in the reign of Henry VIII., otherwise called the double royal or rial, on which the king was represented in the royal robes. The name disappeared after a few reigns, and was revived as applicable to the gold piece of George III., issued 1817, of the value of 20 shillings, which was substituted for the guinea, which had previously been current, of the value of 21 shillings. The gold value of the sovereign in the United States is (1891) \$4.866½.

SOW, v. *sô* [AS. *sáwan*; Goth. *saian*; W. *haw*; Ger. *säen*; Dan. *saae*; Sw. *sada*; L. *satum*, to sow]: to scatter on the ground for the purpose of growth; to spread seed over tilled soil, as a field or garden; to spread; to scatter; to propagate. **SOW'ING**, imp.: N. act of scattering seed on the ground for propagation. **SOWED**, pt. pp. *sôd*. **Sow'**, ER, n. -*ēr*, one who sows. **SOWN**, pp. *sôn*.

SOW—SOWERBY BRIDGE.

SOW, n. *sow* [Dut. *zog*; Low Ger. *söge*; Dan *so*; Sw *sugga*; Ger. *sau*, a sow: comp. W. *soga*, wallowing: L *sus*, a sow]: a female pig or swine; the principal bar of crude iron in the cast run off from a smelting-furnace, the numerous small bars branching off from it on the right and left being called *pigs*. **SOWBREAD**, n. *sow'brëd*, plant akin to the primroses, so named as being the favorite food of the wild boars of Sicily; species of the genus *Cyc'lâmën* (q v).

SOWANS, n. plu. *sō'änz*, or **SOW'ENS**, n. plu. *-ënz* [Scot. *sowen*, weaver's paste: AS. *seaw*, glue, paste]: in *Scot.*, a thick soup or jelly made from the husks or millings of oats—a very nutritious food, called in England *flummery*.

SOWAR, n. *sō'ër* [Hind.]: a soldier in an Indian cavalry regiment.

SOWER, *sō'ër*, **CHRISTOPHER**: 1693–1758. Sep. 25; b. near Marburg, Germany: printer. He received a univ. education, studied medicine, came to America 1724, and engaged in the printing and book-selling business in Germantown, Penn., 1731. He established the first type-foundry and the first printing-ink manufactory in the United States; published the first quarterly magazine and the second ed. of the Bible; and is credited with having made his own paper-stock, invented cast-iron stoves, and made tall 8-day clocks.

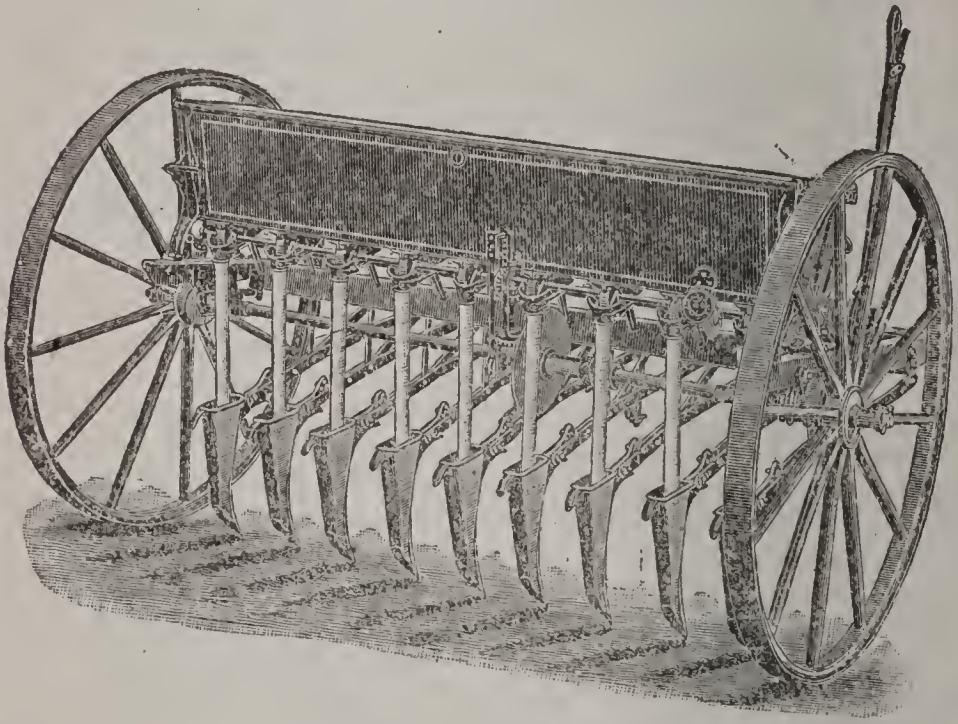
SOWER, **CHRISTOPHER**: publisher: 1721, Sep. 26—1784, Aug. 4; b. near Marburg, Germany; son of Christopher S. (b. 1693). At the age of 26 years he became a minister among the Dunkers, and from his 31st year till his death he was bp. or overseer. Having succeeded (1758) to his father's business, he issued the 2d edition of the great quarto Bible (Luther's version, in German) 1763, and the 3d edition 1776. His book-manufacturing establishment was far the largest in America at the time; and in addition to the business of type-founding, paper-making, etc., he carried on the manufacture and sale of certain medicinal preparations. S. was a man of singular philanthropy and of many charities. He was one of the founders of the Germantown Acad. He was a conscientious opponent of slavery and war, and—for this reason, not favoring armed resistance—suffered confiscation of all his property, imprisonment, and many hardships, as one disaffected toward the popular cause. He refused to seek legal redress, supported himself by his daily toil, preached the gospel *gratis* to his people till his last hour, and died in poverty.

SOWERBY BRIDGE, *sow'ër-bî*: small manufacturing town in the W. Riding of Yorkshire, England; three m. s.w. of Halifax. It contains iron-works, malting-houses, corn-mills, worsted and cotton-factories, chemical works, and dye-works; but woolen manufacture is the principal industry. Pop. (1871) 7,641; (1881) 8,721; (1891) 10,408.

SOWING OF SEED.

SOWING OF SEED: operation of depositing on, or in, the soil the seeds of plants. Sowing differs from planting in that it scatters the seeds either over the entire surface or in rows; in planting seeds, they are placed at certain distances apart. Sowing is done either by hand, which was the original and for a long period the only method, still largely employed even in countries in which agriculture has made greatest progress; or by machines, of which there are various forms. It may be either broadcast, in which the seed is scattered over the entire surface of the ground; or in regular rows called drills.

To render sowing reasonably effective, the ground must first be carefully prepared: neglect of this point is the cause of many failures of grain and fodder crops. By this preparation are secured, principally, suitable mechanical con-



The 'Superior' Grain Drill.

dition of the land by plowing and pulverizing, prompt removal of an excess of water, and abundant supply of plant food. The quantity of seed must be such as to provide sufficient number of plants without crowding; and the quality of the seed is also very important. In some cases the use of means for destroying the germ of smut (see SMUT) or of other fungoid diseases is required. The time of sowing is also of great moment, as seed sown too early may fail to germinate, or will yield only weak plants; while from that which is sown too late, fully ripened crops cannot be obtained.

Wheat, rye, and similar grains are more frequently sown broadcast, though in wheat-culture the drill system has been largely adopted and is growing in favor (see DRILL, in Agriculture). Machines for sowing do the work not only more rapidly but also much more perfectly than by hand. The hand-power broadcast machine sows a strip of ground one to two rods wide, according to the weight of the seed,

SOWLE.

the heavier grains covering the greater distance: the seed is thrown from a rapidly rotating cup, and is distributed with great uniformity. The horse-power broadcast machines, which act on the same principle, can be attached to an ordinary farm-wagon; and will sow wheat and other heavy grains at the rate of 8 to 12 acres per hour. After broadcast sowing, whether by hand or by machine, the seed must be covered: this is done usually by a harrow, but sometimes by a bush or roller.

The advantages of drill over broadcast sowing are: more uniform covering of the seed, marked saving in the quantity of seed, freer admission of light and air to the growing plants, also in the cases of many crops, the opportunity which it offers for cultivation during the early period of their growth. Drill-sowing is done almost wholly with machines: of these, the ones for sowing the ordinary grain-crops are usually drawn by horses, though a few steam-machines are used, and sow several rows at a time. For sowing onions, carrots, and similar seeds, hand-machines, which sow one or two rows at a time, are commonly used. The machines, both power and hand, open the furrow for the seed, which passes through a tube or tubes to the ground, and is covered by the natural falling back of the earth or by metal wings arranged for the purpose. Many of the power-machines also have an attachment for distributing fertilizers. The distance apart of the rows can be varied by the operator. The objections to the narrow trench in which the seed was deposited have been overcome, in some patents, by use of broader shovels which leave the grain in strips 3 or 4 in. wide. Wheat sown in drills is sometimes, though rarely, cultivated. Drill-sowing is more general in England than in the United States. See DRILL, in Agriculture.

Another form of sowing, known as dibbling, formerly practiced to quite an extent in parts of England, consists in depositing seeds in holes made for their reception: see DIBBLE. The work was often done by hand, though various machines were invented for the purpose. The advantages claimed for this system were: considerable saving of seed, and greater facility in cultivating the crop; but as it proved expensive, and in various ways objectionable, it has largely been superseded by other methods. Plants cultivated in the garden are largely grown from seed sown in drills by hand. Here the preparation of the soil, application of fertilizers, time of sowing, and quantity and quality of the seed, require even more attention than in the case of field-crops. It is particularly important that finely pulverized soil be used for covering, and that, if the sowing is done in dry weather, the soil should be firmly pressed upon the seed.

SOWLE, or SOLE, v. *sōl* [Dut. *sollen*, to toss up and down]: in *OE.*, to lug, as by the ears; to drag forcibly.

SOW THISTLE—SOZOMEN.

SOW THISTLE (*Sonchus*): genus of plants of nat. order *Compositæ*, sub-order *Cichoraceæ*, having an imbricated involucre, swollen at the base, with two rows of unequal scales, which at length bend inward; a naked receptacle; the fruit transversely wrinkled and without a beak, the pappus hairy and without a stalk. The COMMON S. T. (*S. oleraceus*) abounds in most parts of Europe and the United States, as a weed in gardens and fields. The tender tops and leaves are used in n. Europe as greens.—The CORN S. T. (*S. arvensis*) is a perennial with large yellow flowers, frequent in grain fields.—Another species in the United States is *S. asper*, the auricles of the leaves rounded instead of acute. All these species, naturalized from Europe, have soft spines on the jagged leaves.—Nearly allied to the genus *Sonchus* is *Mulgedium*, to which belongs the ALPINE BLUE S. T. (*M. alpinum*), whose beautiful blue flowers adorn some of the inaccessible spots of the mountains of Switzerland and Scotland.—In the United States the species of *Mulgedium* are known as False or Blue Lettuce; *M. acuminatum*, 3–6 ft., has barely serrate leaves; *M. Floridanum*, from Penn. w. and s., has the lower leaves lyrate or runcinate; and *M. leucophæum* has a very compound panicle of flowers, pale blue.

SOY, n. *soy* [Japanese, *sooja*]: sauce or liquid condiment, originally prepared in the East. It is made from the seed of the SOY BEAN (*Soja hispida*), plant of nat. order *Leguminosæ*, sub-order *Papilionaceæ*, so nearly allied to the genus *Dolichos* (q.v.) as to be often included in it. The plant, native of China, Japan, and the Moluccas, is much cultivated in China and Japan; and is common in India, though, probably, not native in that country. The seeds resemble those of the Kidney Bean, and are used in the same way. The Japanese prepare from them a substance called *Miso*, which they use as butter.

Soy is made by mixing the beans softened by boiling with an equal quantity of wheat or barley roughly ground. The mixture is covered up, and kept 24 hours in a warm place, to ferment. The mass is then put into a pot, and covered with salt, the salt used being in quantity about equal to each of the other ingredients. Water is poured over it; and it is stirred, at least once a day, for two months, after which the liquor is poured off and squeezed from the mass, filtered, and preserved in wooden vessels: by long keeping, it becomes brighter and clearer. A Chinese sauce, called *Kitjap* (Ketchup), often named, and sold, as soy, is very inferior to the true soy.

SOZOMEN, *soz'o-mên*, HERMIAS SALAMANES: Greek church-historian; b. prob. not later than 400, in Bethelia, Palestine; of a distinguished family; well educated, he studied law at Berytus in Phœnicia, and practiced it in Constantinople. His hist. of Christianity, from Christ's ascension to A.D. 323, was lost. The 9 books of continuation to A.D. 439 remain; but deal much with monastic life and little with facts interesting to moderns; it seems largely copied from Socrates (mentioned below). An ed. was published by Valesius 1659 (often reprinted), bound

SPA—SPACE AND TIME.

with the hist. by Eusebius and a continuation of the same by Socrates Scholasticus of Constantinople, who wrote about the time of Sozomen, and is somewhat more exact and trustworthy, though less elegant in style.

SPA, *spá*: town of Belgium, a watering-place of world-wide celebrity; in a romantic valley amid hills which form part of the Ardennes chain, 27 m. s.e. of Liége, 22 m. s.w. of Aix-la-Chapelle by railway. The prettily-built town consists almost entirely of inns and lodging-houses. The chief edifices are the *Redoute*—plain outside, but handsome within, and including under one roof a theatre (open four times a week), a ball-room, etc.—and the *Vauxhall*, a second Redoute, now little used. Gaming, which figured prominently among the amusements, was suppressed 1872; but the Count de Lannoy (Prince Edgar zu Rheina-Wolbeck) obtained permission (1887) to establish a Strangers' Club for Trente-et-Quarante. The mineral springs, seven in number, of which two are in the town and the rest at some distance, all are chalybeate, and contain minute quantities of iron, so combined with alkaline salts and carbonic acid gas as to be both easily digested and agreeable to the palate. The waters are cold, bright, and sparkling, and are efficacious in complaints of the liver, nervous diseases, etc. Spa water is exported to all parts of the globe. S. is famed for manufacture of wooden toys, stained brown by being steeped in the mineral waters. The number of visitors during the season is about 20,000, of whom half are Belgians. S. was frequented as a watering-place as early as the 14th c., and spa has become a general name for mineral springs.—Pop. (1890) 7,109.

SPACCAFORNO, *spák-kâ-for'no*: city of Sicily, province of Syracuse. Opposite S., Roger, King of Sicily, gained a signal victory over the Saracens 1092.—Pop. (1881) 8,804.

SPACE, n. *spās* [F. *espace*—from L. *spatium*, space: It. *spazio*]: extension, as absolute (see SPACE AND TIME): extension, as in length, breadth, and thickness; room; distance; interval, as between lines; a quantity of time; a short interval: V. among *printers*, to make intervals between lines or between words; in *OE.*, to rove. SPA'cing, imp.: N. among *printers*, the adjustment of the distances between the words in a line. SPACED, pp. *spāst*. SPACIOUS, a. *spā'shūs* [F. *spacieux*—from L. *spatiosus*, roomy]: having ample space or room; roomy; vast in extent; ample. SPA'ciously, ad. *-lī*. SPA'ciousness, n. *-nēs*, the quality of being spacious; largeness of extent.

SPACE AND TIME: the two most general conditions, forms, or attributes of all existing things. The discussion of S. and T. is linked with the profoundest problems of philosophy. Space is co-extensive with, and inseparable from, the sensible, external, or Object World; Time is a property of the Object World and of the Subject Mind.

Of the so-called Innate Ideas maintained by one school of philosophy, S. and T. are the foremost examples. (Other examples are Number, Infinity, Being, Substance,

SPACE AND TIME.

Power, Personal Identity, etc.). Accordingly, it is held on one side, that these notions are underived, or intuitive to the mind; and, on the other side, that they arise in the course of our education or experience, like our ideas of heat, sound, color, gravity, etc.

SPACE.—The supporters of the innate or intuitive origin of the idea allow that it does not rise in the mind until actual objects, or extended things, are presented to the senses—until we see the visible, and touch the tangible things around us; but they declare that this contact with the sensible world is only the *occasion* of our becoming conscious of what was already in the mind. Thus, Mansel (q.v.) says: ‘Space is not properly an *innate idea*, for no idea is wholly innate; but it is the innate element of the ideas of sense which experience calls into consciousness.’ It is, in short, the superadding of some independent activity of the mind to the passive sensation. The reasons usually given for assuming an intuitive element in the idea of Space are, in the main, the reasons given for innate ideas generally; they resolve themselves chiefly into affirming the attributes of *universality* and *necessity* in such ideas, and the inadequacy of mere sensible experience to reveal these high attributes of things. Whatever is got by experience can be thought away; S. and T. cannot. Thus, it is impossible for us to receive any sensible impression of an outward object—the sun, e.g.—without conceiving that thing as existing in space. To use the language of Kant (q.v.), Space is a form of our sensibility, or sensible perception; and as the perception itself cannot, he thinks, give this universal and inseparable form, it must be contributed by the mind. Sir W. Hamilton (q.v.) supposes that we may have an ‘empirical’ notion of Space—i.e., a notion from experience; but that Space as a ‘form’ is not obtained from experience, but from intuition. He does not, however, explain clearly wherein consists the difference between these two notions.

According to the opposite view, now prevalent, Space is an abstraction from our experience of extended things, exactly as gravity is an abstraction from gravitating bodies, and justice from just actions. We first obtain from experience a variety of impressions, in the concrete, of things possessing extension; and, next, from all these, by the usual process of abstraction, we gain a notion of extension in the abstract, or Space. These two distinct operations involve matters of controversy.

1. Before the Muscular Feelings were distinctly recognized as something superadded to the proper perceptions of the senses—or the feelings of mere light, sound, etc.—it was not easy to show that, by sensible experience alone, we could perceive objects as extended, or as occupying Space (see PERCEPTION, in Philosophy). The pure optical sensibility of the eye is for color solely, the pure tactile sensibility is for softness and hardness, roughness and smoothness, etc. When, however, we make full allowance for the whole range of feeling connected with the exercise of muscular energy, there is no difficulty in ac-

SPACE AND TIME.

counting for the origin of such notions as Resistance (Force or Power) and Extended Magnitude. The element supposed, by the *a priori* philosophers, to be contributed by the mind itself, is, according to the other school, Muscularity, or the feeling of the putting forth of inward energy. The two senses related to our cognizance of Space—Sight and Touch—are compound senses; they involve an active energy, with its peculiar consciousness, as well as a passive sensibility; and all that is characteristic of Extension, or Space, arises through these muscular accompaniments.

2. Having perceived a great number of things as extended, with the intervals of unoccupied extension that separate these, we form an idea of extension in the abstract. It has been said that the distinguishing peculiarity of this abstraction is related to *unoccupied* extension, or empty space, where we seem to have extension without anything extended; rendering the idea of Space unlike other abstract ideas, as Gravity, or Justice, which are conceivable only as embodied in gravitating things, or just actions. But it cannot be shown that this idea of extension in the abstract is an idea of *unoccupied* extension; for all space known to science is conceived either as filled with the continuous ether, or as the field of vast counter-poised forces. If infinite 'empty space' exists, it is only to such thought as deems the atmospheric spaces empty; and the common phrase 'infinite space' may have for its real meaning, infinite extension of being. Still, empty space is a convenient expression, setting forth such reduction of resistance as gives practically free scope for movement. To the senses alone, without the muscular accompaniments, Space would be a nonentity, an inconceivability; but the feeling of the sweep of the arm, or of the locomotion of the body, in passing from one point of resistance to another, is a genuine mental experience—the filling up of the interval between two tactile encounters or between two optical pictures, with conscious activity.

TIME.—The idea of continuance, or endurance, applies both to our feelings of energy put forth and to our sensations, emotions, and the flow of our ideas; in other words, it attaches both to the extended or Object World, and to the unextended or Subject Mind. In our muscular feelings, which represent the universe of matter and space, we discriminate a dead strain, or effort of resistance, lasting a short time, from the same strain lasting a longer time; also a more persisting movement from a less. So in the sensations: a sound enduring a second is different to us from a sound enduring two seconds; a transitory odor is not confounded with one of greater continuance. We distinguish two bursts of wonder, terror, love, or anger, if they have been unequal in their duration. Abstracting from all these experiences of continuance in the concrete, we obtain the idea of Time; which idea, however, like other abstractions, must be conceived by us under some individual continuing thing (see ABSTRACTION). If we were to imagine the whole outward universe annihilated, we should still have, in our own consciousness, an instance of

SPADDLE—SPADE-HUSBANDRY.

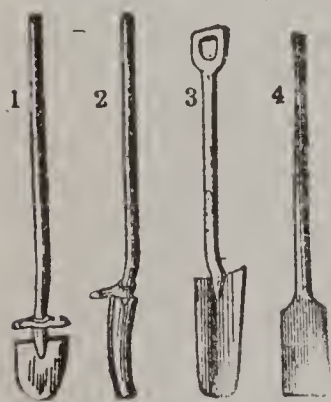
the continuing, and upon that we could sustain the conception of Time. See GENERALIZATION.

A few thinkers, not of the lowest order, fail of satisfaction in either of the two lines above indicated, and regard Space and Time as presenting problems insolvable to man's reason at its present stage. Of these thinkers, some make Space and Time absolute terms expressive of the extent and the duration of the Divine Being; a view usually—perhaps not necessarily—supposed to involve or tend to pantheism. Others, founding on many passages in the New Testament, deem Space and Time merely relative terms of the extension and duration of the present Kosmos, which Kosmos or natural Universe they regard as one dispensation from God, who created all these things through his Son, and as included in the vast cycle limited between Gen. i. 1 (see also Jn. i. 1-3; Col. i. 15-17), as the Beginning; and I Cor. xv. 24-28 as the End. In this view, Time and Space are but symbols of higher realities as yet unknown.

Time is measured by Space, and Space by Time. The one is often expressed by the other, but with a certain limitation; we say 'a space of time,' i.e., extent of time, but not a 'time of space,' though we have such equivalent expressions as 'three-hours' distance.' Movement is common to both. Of passive sensations, the best for indicating time are those of Hearing.

SPADDLE: see under SPADE.

SPADE, n. *spād* [Ger. *spaten*; Dut. *spade*, a spade:



Spades:

- 1, Ancient Greek; 2, Irish; 3, English Draining; 4, Japanese.

Norw. *spode* or *spudu*, a small shovel: It. *spada*, a sword: L. *spatha*; Gr. *spaihē*, a blade—*lit.*, a blade or broad piece of wood for digging]: a common instr. for digging in the ground; a suit of cards: V. to work with a spade. SPA'DING, imp.: N. the operation of digging or paring off with a spade. SPADE'FUL, n. *-fūl*, as much as a spade will hold. SPADDLE, n. *spād'-dl*, n. a small spade; a weed-hook. TO CALL A SPADE A SPADE, to call things by their right names; to be plain-spoken.

SPADE, n. *spād* [etym. doubt.]:

a hart three years old.

SPADE-HUSBANDRY: preparation for, and cultivation of, crops by digging the ground. It can be made profitable only where the areas to be cultivated are small, labor abundant, and wages extremely low. It has been practiced, and still is to some extent, in England, Belgium, Spain, and other European countries. Its advantages over ordinary farming are a deepening and a more thorough pulverization of the soil. In the United States land is so cheap and labor so expensive as to preclude this system; and the use of improved agricultural implements

SPADILLE—SPAIGHT.

renders it unnecessary. The nearest approach which we make to this form of cultivation is Market-gardening, which is carried on to a considerable extent in the vicinity of every large city. By means of deep plowing, thorough fining of the soil, high manuring, and almost constant cultivation, very large crops are produced on limited areas.

SPADILLE, n. *spă-dîl'* [F.]: the ace of spades at ombre and quadrille; also **SPADILIO**, *spă-dîl'yō*.

SPADIX, n. *spā'dîks*, **SPADICES**, n. plu. *spā-dî'sēz* [L. *spādix* or *spādicem*, a palm-branch broken off together with its fruit, of a date or nut-brown color]: in *bot.*, a form of inflorescence in which the flowers are closely arranged around a thick fleshy axis, and the whole wrapped in a large leaf, called a spathe, as in the arum (see **SPATHE**). **SPADICEOUS**, a. *spā dîsh'ūs*, of a clear reddish-brown color; red with a small admixture of gray; resembling a spadix.

SPAE, v. *spā* [Icel. *spá*; Dan. *spaae*, to foretell, to prophesy]: in *Scot.*, to foretell; to forebode. **SPAE'ING**, imp.: N. the act of foretelling; telling fortunes. **SPAED**, pp. *spād*. **SPAE-WIFE**, a woman who professes to tell fortunes by certain signs. **SPAER**, n. *spā'ēr*, fortune-teller.

SPAGNOLET'TO: see **RIBERA**.

SPAGYRIC, a. *spă-jŭr'ík* [said to be from Gr. *spaoō*, I draw; *agei'rō*, I excite]: *semi-slang* for chemical. **SPAGYRIST**, n. *spăj'ir-ist*, in *OE.*, a chemist.

SPAHI, or **SPAHEE**, n. *spā'hē* or *spā'ē* [Pers. *sipdhi* (see **SEPOY**)]: formerly one of the Turkish cavalry. The Spahis were the cavaliers furnished by the holders of military fiefs to the Turkish army, and formed the élite of its cavalry. The Spahis, with the Janizaries (see **JANIZARY**), owe their organization primarily to Orchan, second of the Ottoman sultans, finally to Sultan Amurath I.; and when levied *en masse* could number 140,000, but such a levy was very seldom made. In the field, they were divided into two classes, distinguished by the color (red and yellow) of their standards; one class had pistols and carbine, the other a bow and arrows; and both carried a sabre, lance, and *jerid* or javelin. They were excellent irregular troops; but when European organization was introduced into the Turkish army, they werereplaced (1826) by regular horse. At the present time, the French have 4 regiments of Spahis, raised from among the native tribes of Algeria, under European officers: the dress partakes very much of the Arab character, but the organization is thoroughly European. A squadron of Spahis is always maintained in garrison in Senegambia. See **SEPOY**; **ZOUAVE**.

SPAIGHT, *spāt*, **RICHARD DOBBS**: 1758, Mar. 25—1802, Sep. 6; b. New Berne, N. C.: legislator. He graduated at the Univ. of Glasgow; returned home and became aide to Gen. Richard Caswell 1778; was elected to the N. C. legislature 1781, 2, and 3, and to congress 1783; was a delegate to the federal constitutional convention 1787; became the first native gov. of N. C. 1792; was member of congress 1798—1801; and was a state senator at the time of his death.

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SPAIN, *spān* (Sp. *España*): kingdom in Europe, occupying the larger portion of the great peninsula which forms the s.w. corner of the European continent; reaching further s. than any other European country, and further w. than any other except Portugal. It is bounded n. by the Bay of Biscay and by France, from which it is separated by the mountain ridge of the Pyrenees; e. and s. by the Mediterranean and Atlantic; w. by the Atlantic and Portugal; greatest length, from Fuenterrabia on the n. to Tarifa on the s., 560 m.; greatest breadth, from Cape Finisterre (Land's End), the extreme point on the w., to Cape Creuze, extreme point on the e., about 650 m.; average breadth about 380 m.: area—including the Balearic Isles (q. v.) and the Canary Islands (see CANARIES), and possessions in Africa—197,670 sq. m. Pop. (1877) 16,623,384; (1887) 17,650,234. The country, including the Balearic and Canary Isles, was divided 1834 into 49 modern provinces, though the former division, into 14 kingdoms, states, or provinces, is still sometimes used. The following is a table of the ancient states, and of the modern provinces into which they have been divided, with areas and populations, according to the census of 1887, Dec 31:

| Ancient Provinces. | Modern Provinces. | Area in Eng. Sq. Miles. | Pop. in 1900. |
|--------------------|-----------------------------|-------------------------|---------------|
| NEW CASTILE... | Madrid | 3,084 | 775,034 |
| | Toledo | 5,919 | 376,814 |
| | Gnadajajara | 4,676 | 200,186 |
| LA MANCHA..... | Cuenca | 6,636 | 249,696 |
| | Cuidad-Real | 7,620 | 321,580 |
| | Burgos | 5,480 | 338,828 |
| OLD CASTILE... | Legrono | 1,946 | 189,376 |
| | Santander | 2,108 | 276,003 |
| | Soria | 3,983 | 150,462 |
| | Segovia | 2,635 | 159,243 |
| | Avila | 3,042 | 200,457 |
| | Palencia | 3,256 | 192,472 |
| | Valadolid | 2,922 | 278,561 |
| LEON..... | Leon | 5,936 | 386,083 |
| | Zamora | 4,097 | 275,545 |
| | Salamanca | 4,829 | 320,765 |
| ASTURIUS..... | Oviedo | 4,205 | 627,069 |
| | Coruna | 3,051 | 653,556 |
| GALICIA | Lugo | 3,814 | 465,386 |
| | Orense | 2,694 | 404,311 |
| | Pontevedra | 1,695 | 457,262 |
| ESTREMADURA.. | Badajoz | 8,451 | 520,246 |
| | Caeres | 7,667 | 362,164 |
| | Seville | 5,428 | 555,256 |
| ANDALUCIA..... | Cadiz and Ceuta | 2,834 | 452,659 |
| | Huelva | 3,913 | 260,880 |
| | Cordova | 5,299 | 455,859 |
| | Jaen | 5,203 | 474,490 |
| | Granada | 4,928 | 492,460 |
| | Almeria | 3,360 | 359,013 |
| | Malaga | 2,812 | 511,989 |
| MURCIA | Murcia | 4,453 | 577,987 |
| | Albacete | 5,737 | 237,877 |
| | Valencia | 4,150 | 806,556 |
| VALENCIA | Alicante | 2,185 | 470,149 |
| | Castellon de la Plana | 2,495 | 310,828 |

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| Ancient Provinces. | Modern Provinces. | Area in Eng. Sq. Miles. | Pop. in 1900. |
|---------------------------|--------------------|-------------------------|---------------|
| ARAGON | Zaragoza | 6,726 | 421,843 |
| | Huesca..... | 5,848 | 244,867 |
| | Teruel..... | 5,720 | 246,001 |
| | Barcelona..... | 2,968 | 1,054,541 |
| CATALONIA..... | Tarragona..... | 2,505 | 337,964 |
| | Lerida..... | 4,690 | 270,590 |
| | Gerona | 2,264 | 299,287 |
| | Navarre..... | 4,055 | 307,669 |
| BASQUE PROVINCES... | Biscay..... | 836 | 311,361 |
| | Guipuzcoa..... | 728 | 195,850 |
| | Alvva..... | 1,175 | 96,385 |
| N. AFRICAN SETTLEMENTS... | | 13 | 10,412 |
| Total | | 190,041 | 19,937,873 |
| ISLANDS..... | Balearic..... | 1,935 | 311,649 |
| | Canaries..... | 2,807 | 358,564 |
| | General total..... | 194,783 | 18,618,086 |

By the relinquishment of Cuba and the cession of Porto Rico, the Philippine Islands and Guam to the United States in 1898, and of the remaining Ladrones, the Caroline and Pelew Islands to German in 1899, the colonies of S. were reduced.

| Colonial Possessions. | Area in Eng. Square Miles. | Population. |
|---|----------------------------|-------------|
| AFRICA. | | |
| Rio de Oro and Adrar..... | 243,000 | 100,000 |
| Rio Muni and Cape San Juan..... | 900 | 302 |
| Fernando Po., Annabon, Corisco, Elobey, San Juan..... | 850 | 23,709 |
| Total..... | 252,850 | 124,011 |

Coast-line.—The entire perimeter of the country is 2,080 Eng. m.; and the coast-line, exclusive of windings, 1,317 m., of which 712 m. are on the Mediterranean, and 605 m. on the Atlantic. The n. coast, from Fuenterrabia w. to Cape Ortegal, is unbroken by any considerable indentation. A wall of rocks, varying in height from 30 to 300 ft., extends along this shore; but the water, which retains considerable depth close to the beach, is not interrupted to any unusual extent by islands or rocks. The n.w. coast, from Cape Ortegal s. to the mouth of the river Minho—which separates the Spanish province of Galicia from Portugal—though rock-bound, is less elevated and much more broken than the shores washed by the Bay of Biscay; and the indentations, the chief of which are Noya Arosa and Vigo bays, form secure and spacious harbors. From the mouth of the Guadiana, on the s., to the Strait of Gibraltar, the coast-line, though well defined, is low, sandy, and occasionally swampy. From Gibraltar to Cape Palos

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the shores, backed in part by the mountain range of the Sierra Nevada, are rocky and high (with flats at intervals), are unbroken by indentations, and comprise only two harbors, Cartagena and Malaga. A low and mostly sandy coast extends n. from Cape Palos, rising into rocky cliffs and bluffs in the vicinity of Denia, but extending in sandy flats from Denia to the mouth of the Ebro. From the mouth of this river, n. to the frontier of France, the coast is alternately high and low, and its principal harbors are Barcelona and Rosas.

Surface and Hydrography.—The compactness and the isolation of this country, and its position between two seas, the most famous, and commercially the most important seas in the world, are not more in its favor than the character of its surface, which is more diversified than that of any other country in Europe of equal extent. An immense plateau, the loftiest in the continent, occupies the central regions of S.; bounded n. and w. by mountainous tracts, n.e. by the valley of the Ebro; e. by tracts of land frequently low, but in some parts traversed by hill-ranges; s. by the valley of the Guadalquivir, which intervenes between it and the Sierra Nevada (q.v.). This great plateau lies at a height of 2,000 to 3,000 ft. and covers more than 90,000 sq. m., or about half the entire area of the country. The whole of the Pyrenean peninsula is divided by Spanish geographers into seven mountain ranges, of which the chief are: 1. The Cantabrian Mountains (q.v.), and the Pyrenees (q.v.)—the most northern range; 2. The Sierra de Guadarrama, separating Leon and Old Castile from Estremadura and New Castile, and rising in the peak of Penelara 7,764 ft. above sea level; 3. The Montes de Toledo, part of the watershed between the Tagus and the Guadiana; 4. The Sierra Morena (q.v.), between the upper waters of the Guadiana and Guadalquivir; 5. The Sierra Nevada (q.v.), parallel with the shores of the Mediterranean, through s. Murcia and Andalucia, and rising in its chief summits above any other mountain-system of Europe, except the Alps. The several mountain-ridges, or as they are called, *Cordilleras* of S., have a general e. and w. direction, and between them lie the nearly parallel basins of the great rivers of the country, the Douro, Tagus, Guadiana, and Guadalquivir (see each of these titles).

Climate and Soil.—The climate, owing to the extent and configuration of the country, is exceedingly various. In the n.w. (maritime) provinces, it is damp and rainy during the greater part of the year; at Madrid about 11° s. of London, and only 5° n. of the shores of Africa, winters have occurred of such severity, that sentinels on duty have been frozen to death; while the s. and e. provinces are warm in winter, and are exposed to burning winds from the s., and to an almost tropical heat in summer. Both ancient and modern geographers have adopted difference of climate as the rule for dividing the Peninsula into tracts distinct as well in soil and vegetation as in temperature. Of these tracts or zones the first and most northern may comprise Galicia, Asturias, the Basque Provinces, Navarre, Catalonia,

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and the n. districts of Old Castile and Aragon. In this tract, the winters are long, and the springs and autumns rainy, while n. and n.e. winds blow cold from the snow-covered Pyrenees. The country, which alternates with hill and dale, is plentifully watered by streams rich in fish; and meadows yielding rich pasturage abound. Grain scarcely ripens in the more exposed districts; but grain crops of all kinds are produced in others; also cider, wine, and valuable timber. The middle zone is formed mainly by the great central plateau, and comprises n. Valencia, New Castile, Leon, and Estremadura, with the s. parts of Old Castile and Aragon. The climate of the great part of this region is pleasant only in spring and autumn. Throughout the chilly winter, the treeless table-lands are swept by violent tempests, and in summer are scorched by the sun. The soil is generally fertile, and grain and wine are abundantly produced. The southern or Bætican zone, comprising the rich country between the s. wall of the central plateau and the Mediterranean shores, includes Andalucia, Murcia, and s. Valencia. The stony rampart on the n. protects it from the chilly winds of the central zone; but it is unprotected against the hot winds (the Solana: see SIMOOM) which in summer blow n. from Africa. Here the winter is temperate, and the spring and autumn delightful beyond description. The descent from the cold and mountainous central regions to this tract of tropical heat and fertility affords a striking contrast. The soil, artificially irrigated, is well adapted to agriculture and cultivation of heat-loving fruits: the products comprise sugar, cotton, and rice, and the orange, lemon, and date.

Material Revival of Spain; Population; and Distribution of Land.—Owing to a number of causes, S., at one time the most opulent kingdom in Europe, had, in the 18th c., lapsed into complete stagnation; the spirit of enterprise seemed extinct, and ease and squalor to be preferred to labor and affluence. Before the commencement of the 19th c., however, the country began to throw off its lethargy; and its advance in activity has gradually accelerated. The pop. has increased, and is increasing; agriculture, previously stagnant, is now active and successful; manufactures are multiplying rapidly; and railways, of which, in the beginning of 1848, not a mile had been constructed, are now in construction between all the great centres of population—more than 4,000 m. having been complete by 1880, and more than 6,000 m. by 1889. The estimates of pop. for various periods between the beginning of the 16th c. and the middle of the 18th c. vary considerably; but it is certain that there was (1500–1700) gradual decrease of 2,000,000 to 3,000,000 of inhabitants. For later times, we have the following authentic statement:

| Year. | Pop. |
|-----------|------------|
| 1768..... | 9,159,999 |
| 1797..... | 10,541,221 |
| 1857..... | 15,464,340 |
| 1860..... | 15,673,536 |
| 1870..... | 16,835,506 |
| 1887..... | 17,650,234 |
| 1900..... | 18,618,086 |

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It thus appears that in about a century the population of S. increased more than 7,000,000. The largest increase 1870-77 was in the provinces Madrid, Barcelona, Cadiz, Valencia, Jaen, Tarragona, Murcia, Avila, Valladolid, and Salamanca; 1877-87 the greatest increase was in the provinces Huelva and Biscay; and the most densely populated provinces were Barcelona, Coruña, Madrid, and Valencia. These mostly are maritime provinces, or such as have railway facilities for communication with the sea. In the provinces naturally poor or inadequately provided with means of communication, e.g., Soria, Teruel, and Almeria, the pop. was either diminishing or stationary 1887. In 1887 there were in Spain one town of 470,283 pop. (Madrid); one of 272,481 (Barcelona); three between 170,000 and 134,000 (Valencia, Seville, Malaga); three between 98,000 and 73,000 (Murcia, Zaragoza, Granada). The vast mountains, generally affording scanty herbage, are utilized for pasture in large farms. But in the warm and fertile plains, especially where water is abundant, farms are small. A few years since, it was estimated that there were about 3,426,000 farms of all sizes; of which 750,000 were occupied by tenants, the others by proprietors. More than 40 per cent of the surface of the kingdom is still uncultivated.

Origin of the People.—The Spaniards are a mixed race, and have sprung from greater variety of stocks than any other European nation. The bulk of the people is doubtless in the main from the ancient Celtiberian occupants of the peninsula: see CELTIBERI: HISPANIA. At an early time, however, there were extensive Phœnician and Carthaginian settlements in S., especially on the e. sea-board. Later, the country was penetrated with Roman elements, and was Romanized throughout, save in the Basque (q.v.) region, where the ancient speech still lives on intact. Gothic invasions left a large Germanic strain in the blood of Spain, yet plainly traceable in the n.e. hill-country. The Arab conquerors of S. planted themselves too firmly on Spanish soil to be utterly expelled; and the Moriscoes (see MOORS) are still, to the number of 60,000, easily distinguishable by their linguistic and other peculiarities. In the s. and centre, Gypsies (*Gitanos*) are numerous, and there are some Jews. One result of this commingling of races is seen in the strongly marked provincial peculiarities of Spain, extending not merely to dialectal differences, but also to physique, character, and amusements. The Castilian is the literary language of Spain; the Andalusian diverges somewhat broadly from it; in Catalonia, Valencia, and on the Balearic Isles, the prevailing dialect is closely allied to Provençal; while in the Basque Provinces the old tongue is still in universal use. Until lately (see FUERO), the Basques enjoyed quite peculiar privileges as to local govt. and administration. In spite of great local differences of character, the Spaniard generally is temperate, and his few wants are easily satisfied. He requires a daily siesta, is not very energetic by nature, loves music, dancing, and the bull-fight, and is not averse to intrigue and

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the use of weapons. Even amid poverty and squalor, native dignity does not forsake him. The houses generally are poorly furnished and uncomfortable, and often far from cleanly.

Religion.—Till in recent times, the Rom. Cath. faith, to which almost all the nation adheres, was the only creed tolerated by law. There are 9 archbishoprics, 51 suffragan bishoprics, and 4 unattached bishoprics. Before the suppression of the monasteries 1836, about one-fifth of the whole nation was engaged in some form of official service of the church.

Occupations of the People.—Agriculturists, laborers, miners, artisans, shepherds, and sailors constitute two-thirds of the population; one-seventh is composed of merchants and tradesmen; another seventh of officials, the army, the nobility, the clergy, nuns, beggars, and prisoners. The nobility is very numerous; the lower nobility, mostly quite poor, counting near 1,000,000 *hidalgos*. Beggars are almost as numerous, owing partly to the large number of benevolent institutions—benevolent rather than beneficent. In 1890 about 500,000 persons were maintained in 1,028 charitable institutions.

Productions, Commerce, Exports and Imports, etc.—The countries with which S. trades most are France, Great Britain, and the United States; and of these countries, France receives the great bulk of exports, with Great Britain second, and the United States third. The foreign trade is mostly through the following ports: Barcelona, Cadiz, Santander, Alicante, Malaga, Valencia, Bilbao, Cartagena, San Sebastian, Elizondo, and Irun. The principal articles imported are, in the order of their importance, raw cotton, grain and flour, coal, timber, sugar, cod-fish, wool manufactures, machinery, tobacco, iron, petroleum, hides and skins, linen, chemicals, railroad and ship-building materials, cacao, silk manufactures, and cotton goods. Chief exports are: wine, copper, iron, lead, cork, oranges, raisins, animals, wool, shoes, olive-oil, esparto grass, and grapes.—Total imports (1889) \$134,821,910; (1901) \$164,633,500; total exports (1889) \$152,532,970; (1901) \$134,518,319. In 1900 the merchant navy consisted of 449 steamers and 693 sailing vessels, total tonnage 541,964. There were about 8,300 m. of railway.

The cotton manufactures of S. have been advancing, and silk stuffs are largely fabricated; the principal cotton-factories are at Barcelona. Excellent paper is made at Telosa and Valladolid. All manufactures of tobacco, arms, and gunpowder are carried on by govt. exclusively. In 1888 a new industry was started in the provinces of Cadiz, Seville, and Malaga—the manufacture of cognac, which, taken from the rich grapes of those districts, has proved far superior to the French brand. Though neither the agriculture nor the mineral resources of Spain are properly developed, much progress has been evident of late years, chiefly in mining. Lead, copper, and tin are abundant; quicksilver is wrought; and there are large de-

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posits of good coal and iron ore: the iron deposits, however, are so imperfectly worked that great quantities of iron and coal are imported from Belgium and England.

Army and Navy.—It was estimated 1897 that S. could mobilize an army of 1,083,595 men. Her standing army is 119,432. There are in S. 13 military schools and colleges. In the war with the United States, especially in battles of Cavite and Santiago, S. was stripped of her formidable navy, losing in the first named engagement 7 large vessels and in the second 6. Strength 1903: one ship rate 3, one of rate 4, 3 of rate 5, one of rate 6, one of rate 7. There are 6 destroyers and 7 torpedo boats, besides 2 cruisers building.

Revenue, Expenditure, Debt.—The outstanding national debt in 1902, March 31, was \$2,023,739,176. The public revenue 1898-99 was 842,532,714 pesetas (\$162,608,874) and expenditures 878,398,568 pesetas (\$169,530,923); in 1902, 974,437,748; and 971,176,259 pesetas.

Education.—Returns show that 68 per cent. of the total population can neither read nor write; 3 per cent. can read only, and 29 per cent. can read and write. There are 10 important universities in S., attended by about 13,000 students; there are also numerous schools of art, of navigation, and mining; there are ten academies or learned societies, and a few large libraries.

History.—S., the *Spania*, *Hispania* (q.v.), and *Iberia* of the Greeks, and known to the Romans by the same names, was inhabited at the period when first it receives historical mention by a people deriving their origin from different races. It is supposed to have been inhabited originally by a distinct race called Iberians; upon whom, however, a host of Celts are supposed to have descended from the Pyrenees. In the earliest times of which we have any record, these two races had already coalesced and formed the mixed nation of the Celtiberians (see CELTIBERI), massed chiefly in the centre of the peninsula, in the w. districts of Lusitania, and on the n. coasts. In the Pyrenees and along the e. coast were found pure Iberian tribes, while unmixed Celtic tribes occupied the n.w. In Bætica (Andalucia) was large admixture of the Phœnician element, and on the s. and e. coasts numerous Phœnician, Carthaginian, Rhodian, and other colonies. A portion of the s. coast, called Tartessus by the Greeks, the 'Tarshish' of Scripture, was frequented for its mineral riches by the Phœnician merchantmen, and the 'ships of Tarshish' were as distinct a section of the Tyrian mercantile marine as were the Spanish galleons of the 16th c., or the British Indiamen of more recent times. But the bond which connected the Iberians and the Phœnicians was merely commercial. About the middle of B.C. 3d c., the Carthaginian influence began to be much felt in Iberia, and a considerable territory was brought under subjection to Carthage by Hamilcar (q.v.), who founded the city of Barcelona. During the next eight years, the Carthaginian interest was

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advanced, and its power further strengthened by Hasdrubal (q. v.—died B.C. 220), son-in-law of Hamilcar, who founded Carthago Nova (modern Cartagera), and concluded a treaty with the Romans whereby it was stipulated that he should not advance his standards n. of the Iberus (Ebro). Hannibal (q. v.), son of Hamilcar, and greatest of all Carthaginian generals, now assumed the command in the peninsula. He attacked and destroyed Saguntum (q. v.), violating the treaty between his father and the Romans: see PUNIC (PUNICA FIDES). The destruction of Saguntum was the cause of the Second Punic War, for whose principal incidents, see CARTHAGE: ROME: HANNIBAL: SCIPIO, PUBLIUS CORNELIUS: SCIPIO ÆMILIANUS. After the Romans had driven the Carthaginians from the peninsula B.C. 206, the country was erected into a Roman province, consisting of two political divisions—*Hispania Citerior* (Hither S.), including the e. and n. districts, or those nearest the centre of the Roman empire; and *Hispania Ulterior* (Further S.), including the districts furthest from Rome, or the s. and w. districts. It was not, however, till B.C. 25 that the Cantabri and Astures, in the extreme n. of the country, laid down their arms to Augustus. After the country had been reduced to subjection, it was divided into the three provinces of Tarraconensis (embracing the n. and e. provinces), Bætica (Andalucia), and Lusitania (Portugal and some w. provinces). This division of the country lasted till the reign of Constantine the Great (q. v.) (306–337). From the time of the complete supremacy of the Romans till the death of Constantine, the condition of S. was eminently prosperous. The inhabitants, when brought under the iron rule of the empire, were forced for the time to desist from the intestine wars in which it had been their habit to indulge: and adopting the language, laws, and manners of their conquerors, they applied themselves to industrial pursuits, and increased remarkably both in wealth and in numbers. Everywhere throughout the country, towns purely Roman sprang up, chief among which were Leon. Emerita Augusta (Merida), Pax Julia (Beja), Cæsaraugusta (Zaragoza); and numerous aqueducts, bridges, amphitheatres, etc., were built, whose ruins are the wonder of the modern traveller. S., though obtained at enormous cost both in treasure and in human life, was for three centuries the richest province of the Roman empire. Its fertile fields formed for a considerable time the granary of Rome; and from its metal-veined sierras an immense treasure in gold, silver, etc., flowed into the Roman coffers. ‘Twenty thousand pound-weight of gold,’ says Gibbon, ‘was annually received from the provinces of Austria (Asturias), Galicia, and Lusitania.’ This wealth was not the voluntary offering of the natives, who were compelled to labor in their mines for the benefit of strangers; thus S., in the early ages, was the type of Spanish America in the 15th and succeeding centuries, with the single difference that in the first case the Spaniards were the slaves, and in the second the slave-holders. A.D. 409, hordes of barbarians, Alans. Vandals, and Suevi,

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crossed the Pyrenees and swept over and desolated the peninsula—the Vandals mostly settling in Bætiea, the Alans in Lusitania (Portugal), and the Suevi in Leon and Castile. About 412 the Visigoths invaded the country, and their king, Athaulf, who acknowledged a nominal dependence on the Roman emperor, established the Gothic monarchy in Catalonia: see GOTHs. Of the Visigoths—by whom the Suevi were subjugated (584), and by whom the Vandals and Alans were expelled (427) from the country, and large portions of Gaul annexed to their Spanish dominion—the most remarkable kings were Wallia (reigned 415–418), who greatly extended the Gothic monarchy; Euric (reigned 466–483), who, besides increasing his territory, introduced and enforced a body of laws, and did much for advancement of civilization in S.; Wamba (reigned 673–680), who built a fleet for protection of the coasts; and Roderick (q.v.), killed at Xeres de la Frontera 711, in battle with the Moors. The battle of Xeres gave the Moors almost undisputed mastery of nearly the whole of S., as well as of the outlying Gothic province of Septimania (Languedoc) in France; for the remnant of the Goths betook themselves to the highlands of Asturias, Burgos, and Biscay, where, in a region which throughout had enjoyed more liberty than any other part of S., they maintained their independence.

Dynasty of the Moors.—The Arabs, more properly termed the Moors (q.v.), held S. for the first few years of their rule, as a dependency of their province of n. Africa; but after the downfall of Muza (q.v.), and of his son Abd-el-aziz, who had been the deputy-gov. of Spain, the country was governed (717) by *emirs* appointed by the caliph of Damascus. The favorite scheme pursued by the Spanish emirs was the extension of their conquests into Gaul, to the neglect of the rising power of the Goths in Asturias; they took also the Balearic Isles, Sardinia, Corsica and part of Apulia and Calabria; the Mediterranean was infested by their fleets, but their northward progress was most signally checked on the plain of Tours by Charles Martel (q.v.). Anarchy and bloodshed were prominent features of the first 40 years of Mohammedan rule in Spain. The *walis*, or local governors of districts and provinces, frequently rebelled against the emir, and drew sword against each other according as ambition or animosity dictated. Within this period of 40 years, no fewer than 20 emirs had been called to the direction of affairs; but a revolution at Damascus, which unseated the Ommiades (see OMMIADES—O. OF SPAIN), and placed the Abbasides in possession of the caliphate, ended this misrule in S. The last of the *emirs*, Jussuf, was in favor of the Abbasides, but the *walis* and *alcaydes*, being chiefly of the Ommiade faction, invited one of this family, who was in concealment among the Zeneta Arabs in Barbary, to become an independent caliph in Spain: see OMMIADES. Thus was founded the *caliphate of Cordova*, from which, 778, the Franks wrested all its possessions n. of the Pyrenees, and northeastern S. to the Ebro; the latter acquisition, subsequently denominated the *Spanish March*,

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being alternately in the hands of the Moors or dependent on France.

Christian Kingdoms.—During this period of Moorish domination, the small independent kingdom of Asturias, founded by Pelayo (q.v.), had been growing in power and extent. It was increased by Galicia 758, and by parts of Leon and Castile toward the close of the century. In 758, a second independent Christian kingdom was founded in in Sobrarve, and increased by portions of Navarre on one hand and Aragon on the other; but though it with the French Gascons, aided the Moors at Roncesvalles (q.v.), it was, 801, again swallowed up by the caliphate of Cordova. However, 36 years later a Navarrese count, casting off his allegiance to France, founded the third Christian kingdom, that of Navarre (q.v.), which from this time easily maintained itself, owing to its situation, in independence of the Moors. The kingdom of Asturias, now (900) Leon, was for a long time distracted by bitter and bloody strife among the members of the royal line, and with its neighbor Navarre would have fallen an easy prey to the powerful Omniades, had not the latter directed their chief attention to the subjugation of Morocco; and under cover of this relaxation of the constant warfare between Moors and Christians, another independent monarchy, an offshoot from Leon, was founded in Castile (933, kingdom in 1035), which, from its central position, and consequent greater facilities for expansion, soon became the most powerful of the Spanish states, especially after its union (temporary, 1072–1157) in 1230 with Leon. A considerable part of Aragon had been wrested from the Moors by Sancho III. (1000–35) of Navarre, and at his death this part of his dominions passed by inheritance to his son Ramiro, who added to it the districts Sobrarve and Ribagorza, and a considerable territory which he conquered from the common enemy, the Moors. This kingdom of Aragon was the last Christian kingdom formed in S.; and though it increased, by acquisitions from the Moors, yet being limited by Leon, Castile, and Navarre on one side, and the Spanish March (now only the county of Catalonia or Barcelona) on the other, its princes aimed at maritime power; and by the union, through the marriage of the Count of Barcelona with Queen Petronilla, of the Spanish March with Aragon, means were obtained of carrying out this policy; and the spread of the Aragonese dominion to Sicily (q.v.), Naples (q.v.), and other regions bordering on the Mediterranean, was the consequence. These three kingdoms—Castile and Leon, Navarre, and Aragon—continued, sometimes in combination and sometimes separately, to war against their common enemy, the Moors—Castile being, from its greater power and proximity, the most persistent assailant; and Navarre, for the opposite reason, the least so; but whenever the arrival of fresh levies from Africa, or the accession of an energetic caliph threatened serious danger to any one of the three, the others generally came to its aid.

The extinction of the Omniades in Spain 1031, and the

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disruption of the caliphate into the minor kingdoms Cordova, Seville, Toledo, Lisbon, Zaragoza, Tortosa, Valencia, Murcia, Badajos, and seven others of less note, was an occurrence by which the kings of Castile and Aragon did not fail to benefit; for by well-directed and unremitting attacks they subdued some, rendered others tributary—the kings of Portugal also on their side gallantly and successfully pursuing the same policy; and a few years more would have certainly annihilated Moorish domination in S., had not Mohammed of Cordova and Seville, hard pressed by Alfonso VI. of Leon and Castile about the close of the 11th c., applied for aid to an Arab tribe, whose military career in n. Africa had been most brilliant. This tribe, the Almoravides (q.v.).—i.e., men devoted to the service of God—had made themselves masters of the provinces of Africa and Almagreb, and founded the empire of Morocco. Responding to the request of Mohammed of Cordova and Seville, the Almoravides crossed over to S.; defeated the king of Aragon and Castile, and recovered much of New Castile. Then turning on their ally Mohammed, they compelled him to yield up the provinces of Cordova and Seville, and all the minor Moorish princes to follow his example; so that 1094, the Almoravide sovereign was acknowledged sole monarch of Mohammedan Spain. The power of this tribe, however, began to decline about 1130 and was extinguished by the Almohades (q.v.), a fanatical sect of Mohammedans, who landed in S. in the middle of the 12th c., and conquered the territories of the Mohammedans in Spain. During the reign of the third monarch of this dynasty took place the battle between the combined forces of Castile, Leon, Navarre, Aragon, and Portugal, with the Moors, in which the former gained the most celebrated victory ever obtained by the Christians over their Moslem foes—the latter losing, according to the account transmitted to the pope, 100,000 killed and 50,000 prisoners. This sanguinary conflict on the plains of Tolosa (*las navas de Tolosa*), 1212, July 16, broke the Almohade power in Spain, as that of Salamanca 1812, July 22, almost exactly six centuries afterward, broke the more formidable strength of Napoleon. On the fall of the Almohades, Mohammed-ben-Alhamar, King of Jaen, rose to the first place among the Mohammedan princes, and founded (1238) the *kingdom of Granada*. The king of Granada was speedily forced to become a vassal of Castile, and from this period all danger from Moslem power was over. The rest of the history of the Spanish kingdoms before their union, calls for no detailed account. The Castilian court was the scene of almost constant domestic strifes and rebellions, varied with a campaign against Granada or in favor of the monarch of that kingdom against his rebellious vassals; the only prominent monarchs of this kingdom being Ferdinand III., who confined the Moorish dominion s. of Andalucia, Alfonso X. (q.v.), Alfonso XI., Pedro the Cruel (q.v.), and Queen Isabella, last sovereign of Castile (see ISABELLA, of Castile), who succeeded her brother Henry IV., owing to a wide-spread belief in the illegitimacy of Henry's daugh-

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ter. Aragon, on the other hand, was almost wholly free from intestine dissensions, doubtless because of the interest taken by the Aragonese monarchs in Italian politics; of these sovereigns Jayme I. (reigned 1213-48) conquered Valencia and Majorca, and, first of all the Aragonese kings, received a voluntary oath of allegiance from his subjects; Pedrò III. (reigned 1248-85) who obtained Sicily (1282), Minorca, and Iviza; Jayme II., who conquered Sardinia and Corsica; Alfonso V. (reigned 1416-68), who conquered Naples; and Ferdinand II. (q.v.), the Catholic, last sovereign of Aragon, who, by marriage with Isabella, Queen of Castile (q.v.), 1469, the conquest of Granada 1492, and that of Navarre 1512, united the whole of Spain, and French Navarre, under one rule.

The year 1492, in the reign of Ferdinand and Isabella, witnessed also the discovery of America, as well as the capture of Granada. S. had now become consolidated into one empire, from the Pyrenees to the Strait of Gibraltar; civil wars were at an end; and a splendid continent, teeming with riches, had been opened up for Spanish adventure and enterprise. But, as the most active spirits among the Spaniards now crowded to the new world, the soil of S., and its mineral treasures, both inexhaustible sources of wealth, were neglected for the riches of the fancied *El Dorado*, where, as was everywhere believed, gold was more plentiful than iron was in the old country. Besides the drain on the country from emigration, the expulsion of the Jews and Moors was productive of direst results; and the decline of the splendid Spanish Empire, on which the sun even then never set, may be said to have had its origin in the event which raised the country to the height of its magnificence. Charles I. (Charles V. of Germany, q.v.) succeeded Ferdinand on the Spanish throne; and in his reign Mexico (q.v.) and Peru (q.v.) were added to the possessions of Spain.

Philip II. (q.v.), by his enormous war expenditure and mal-administration, laid a foundation for the decline of the country. Industry, commerce, and agriculture may be said to have been extinguished at the expulsion of the *Moriscoes* (see *MOORS*); and the reigns of Philip III. and Philip IV. witnessed a fearful acceleration in the decline of S. by the contests with the Dutch, and with the German Protestants in the *Thirty Years' War*, the intermeddling of Olivarez (q.v.) in the affairs of n. Italy, the rebellion of the Catalans, whom the minister wished to deprive of their liberties, the wars with France, and the rebellion of Portugal (1640), which had been united to S. by Philip II. The reign of Charles II. was still more unfortunate, and his death was the occasion of the *War of the Spanish Succession* (see *SUCCESSION WARS*). Philip V. (q.v.) was the first of the Bourbon dynasty who occupied the throne of Spain. Under Charles III. (reigned 1759-88), a wise, enterprising, and enlightened prince, the second great revival of the country commenced; trade and commerce began to show returning activity, and population increased. During the inglorious reign of Charles IV. (reigned 1788-1808), who

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left the management of affairs in the hands of the incapable Godoy (see ALCUDIA), a war (1796-1802) broke out with Britain, which was productive of nothing but disaster to the Spaniards; and by the pressure of the French another war arose 1804, with similar ill success. Charles abdicated in favor of his eldest son, the Prince of Asturias, who ascended the throne as Ferdinand VII. Forced by Napoleon to resign all claims to the Spanish crown, Ferdinand became a prisoner of the French in the year of his accession, and in the same year Joseph, brother of the French emperor, was declared king of S. and the Indies, and set out for Madrid, to assume the kingdom thus assigned to him. But before this time, an armed resistance had been organized throughout the country. The various provinces elected juntas or councils, consisting of the most eminent inhabitants of the respective neighborhoods, and it was the business of these juntas to administer the government, raise troops, appoint officers, etc. The supreme junta, that of Seville, declared war against Napoleon and France, 1808, June 6. In July, England, on solicitation, made peace with S., recognized Ferdinand VII. as king, and sent an army to aid the Spanish insurrection. Joseph, July 9, entered S., defeated (through his lieut. Bessières) the Spaniards at Rio Seco, and entered Madrid on the 20th; but the defeat of Dupont at Baylen by the veteran Spanish gen. Castaños, altered the position of affairs; and Joseph, after a residence of ten days in his capital, was compelled to evacuate it, and retire to Vitoria. The noble defense by Palafox of the city of Zaragoza against Lefebvre, and the return of the Marquis de la Romana with 7,000 regular troops who had been wiled from the country by Napoleon, did much to inspire the patriots. 1808, July 12, Sir Arthur Wellesley, afterward Duke of Wellington (q.v.), at the head of the British auxiliary force, landed (Aug. 5) at Mondego Bay, and began the Peninsular War by defeating the French at Roliza and Vimiero (q.v.); but in spite of his opposition, the Convention of Cintra was signed, and the French transported to their own country. 1808, Nov., Napoleon, who had been preceded by Ney (q.v.) with 100,000 men, entered S., and at once assumed the command. For a time his armies were completely successful; Soult utterly routed the Spanish gen. Belvedere, Nov. 10, and annihilated Blake at Reynosa on the 13th. Castaños and Palafox were routed at Tudela by Lannes, and in the beginning of Dec., Napoleon entered Madrid. At this time, the British forces were under the command of the gallant Sir John Moore (q.v.), who, aware of his great inferiority in numbers and resources, retreated w. from Salamanca, whither he had come to assume command of the allied forces, and reached Coruña (q.v.) 1809, Jan. 11. On Apr. 22, Gen. Wellesley (see WELLINGTON, DUKE OF) arrived in Portugal; and, at once commencing operations, drove Soult from Oporto, and took possession of Portugal; then, favored by the disunity of action which subsisted between the three or four French armies who held S., he directed his attacks on the army of the centre, retreating when any

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of the others came to its aid, and by dint of masterly generalship and bold enterprise, succeeded, after four campaigns, in driving the French from the country. To this

The inhuman treatment of the citizens of Cuba by the Spanish authorities, 1896-98, and the destruction of an American battleship in Havana harbor (q.v.) while on a friendly visit, brought about war between S. and the United States (see SPANISH-AMERICAN WAR), 1898, April 21, which ended by the Treaty of Paris signed 1898, Dec. 10, and the cession of Porto Rico and the Philippines to the U. S. and the surrendering of the Spanish sovereignty over the island of Cuba.

SPAKE, *v. spāk*: did speak, pt. of speak, but now nearly obsolete: see SPEAK.

In 1812 a constitution, on the whole liberal, had been devised for the country by the cortes of Cadiz. It was abrogated, however, by Ferdinand VII. (q.v.), who treated with infamous ingratitude the subjects who had shown such devoted loyalty to him, and obtained the aid of France to establish despotism. The reign of his daughter, Isabella II., was disturbed by the Carlist rebellion 1834-39, in which the British aided the queen with an army under Sir De Lacy Evans: see CARLOS. The next event of importance was the contest between Espartero (q.v.) the regent, and the queen-dowager Christina, for the supreme power during the minority of the queen. Espartero was successful 1840-43, but was compelled to flee before O'Donnell and Narvaez, and was not restored till 1847. The constituent cortes of 1837 drew up a new constitution, based on that of Cadiz. In 1845 another constitution was promulgated by Narvaez (q.v.), Duke of Valencia. Frequent changes of ministry, occasional revolts, the banishment of Queen Christina (1854), the formation of the O'Donnell ministry (1858), the war with the Moors (see MOROCCO), the annexation of San Domingo (1861), and the quarrels between S. and her former colonies, Peru (1864-5) and Chili (1865), were the most marked events in the more recent history of Spain prior to 1868. In 1868 Isabella was driven from the throne by a general revolt; and the cortes, 1870, Nov., elected Prince Amadeo of Italy to be king. Amadeo abdicated early in 1873, when the form of government was changed to a republic. During the remainder of 1873 and the whole of 1874, S. was the scene of anarchy and bloodshed resulting from the mutual opposition of the Carlists and republicans. 1874, Dec. 30, the son of the ex-queen Isabella was declared king of S. as Alphonso XII. Born in 1857, he died 1885, Nov. 25, leaving two daughters, one of whom, Maria de las Mercedes, succeeded him, under the regency of the queen, till 1886, May 17; when a son, Alphonso XIII., was born, who succeeded his sister by right of birth; and the regency was extended to cover his minority.

SPAKE, *v. spāk*: did speak, pt. of speak, but now nearly obsolete: see SPEAK.

SPALATO—SPALDING.

SPALATO, *spâ-lâ'tō*, or SPALA'TRO, *-trō* (in Illyric, SPLIT): important seaport of Dalmatia, empire of Austria; finely situated on a promontory on the e: coast of the Adriatic. It originated in the famous palace of Diocletian, built in the 3d c. This immense structure (12 years in building) stood not far from the city of Salonæ, the great bulwark of Roman power in Dalmatia; and when Salonæ was conquered by the Avars in the 7th c., the inhabitants fled for refuge to this fortress-palace, where they laid the foundations of a new town, named *Aspalathum*, *Spalathon*, *Spalathron*, or *Spalatum*, whence the modern *Spalato*. Even yet, more than one-half of the town is compressed within the limits of the ancient palace, a considerable portion of whose walls remain. The best-preserved parts of the palace are the temple of Jupiter, transformed in the 7th c. into a Christian cathedral; and the temple of Æsculapius which is now a baptistery dedicated to St. John. Of special interest are the ruins of an aqueduct constructed of massive hewn stones. Modern S. is divided into an old and a new town; the former consisting mainly of narrow, crooked, and dirty lanes; the latter more agreeable and open. It is the seat of a bishop, has a chamber of commerce and manufactures, and is the principal emporium for goods passing from Italy overland into Turkey. Pop. 14,513.

SPA'LAX: see MOLE-RAT.

SPALDING, *spawl'ding*: important market-town and river-port in Lincolnshire, England; on the Welland, 8 m. from its mouth in the Wash. Considerable trade is carried on by the Welland, and vessels of 100 tons can reach the town. An important stock and corn market is held every Tuesday. S. was a place of consequence as early as the Saxon times, and contained a Benedictine monastery. Pop. (1881) 9,260; (1891) 9,014.

SPALDING, *spawl'ding*, MARTIN JOHN: Roman Cath. prelate: 1810, May 23—1872, Feb. 7; b. Marion co., Ky. Having completed his classical studies and studied theology in seminaries in Ky., he went to Rome and entered the Propaganda Coll. Ordained priest 1834, he returned to Ky., and was successively prof. of philosophy in St. Joseph's Coll., Bardstown, pres. of that coll., and vicar-gen. of the diocese of Louisville, till 1848, when he became coadjutor bp. and soon after titular bp. of Louisville. In the mean time he had established the *Catholic Advocate*, a powerful organ of Rom. Cath. opinion. He was much esteemed as a public lecturer and preacher, and for philanthropic effort. His contributions to Rom. Cath. biographical, historical, and theological and polemic literature were numerous and important. He was made abp. of Baltimore 1864. In the Vatican Council of 1869-70 he was at first an 'inopportunist,' but then faced about and became the zealous champion of papal infallibility.

SPALDING—SPALLANZANI.

SPALDING, SOLOMON: 1761–1816; b. Ashford, Conn.: author. He served in the revolutionary army; graduated at Dartmouth College 1785; was ordained a Congl. minister 1787; and after preaching three or four years engaged in mercantile business and literary work. While living in Conneaut, O. (1810–12), he wrote a romance based on the idea that the American Indians were descended from the lost tribes of Israel, entitled *The Manuscript Found*. It is claimed that this MS. was copied by Sidney Rigdon in the Pittsburgh printing-house to which it was sent for publication, and that after the death of S. this copy was made the original of *The Book of Mormon*. This the Mormons (q.v.) vigorously deny.

SPALE, or **SPAIL**, n. *spāl* [Dut. *spelle*, a splinter: Icel. *spjall*, a lath. a thin board: AS. *speld*, a chip for lighting: Gael. *spealt*, a splinter; *spealt*, to cleave]: in *Scot.*, a lath; a chip; a shaving of wood.

SPALL, n. *spawl*: in *masonry*, a chip of stone removed by the hammer: V. to reduce irregular blocks of stone to an approximately level surface: in *mining*, to break, as ore, with a hammer, previous to cobbing.

SPALL, or **SPALLE**, n. *spawl* [OF. *espaule*; It. *spalla*; F. *épaule*, a shoulder—from mid. L. *spat'ūla*, the shoulder-blade—from L. *spatha*, a flat wooden instr. (see **SPADE**)]: in *OE.*, the shoulder.

SPALLANZANI, *spāl-lân-dzâ'nē*, LAZARO: 1729, Jan. 12—1799, Feb. 12; b. Scandiano in Modena, Italy: naturalist and anatomist. After a careful education, he took clerical orders; and 1754 was appointed to the chair of logic, metaphysics, and Greek at Reggio; but soon after this he obtained a chair at Modena, and refusing offers by the Universities of Parma and Coimbra, and the Acad. of St. Petersburg, applied himself to study of natural history. His attention was directed to the doctrine of generation propounded by Needham and Buffon; which, after careful study and experiment, he overturned. He then studied the circulation of the blood, and was the first to follow its course through the intestinal tube, the liver, spleen, ventricles, pulmonary organs, etc.; 'established,' according to Senebier, 'the propulsive power of the heart over the blood in the various vessels, demonstrated that the heart never wholly empties itself, explained the various causes which retard the circulation, and the obstacles produced by the weight of the blood.' On the re-establishment of the Univ. of Pavia, S. was appointed (1768) prof. of nat. history, and keeper of the museum, which he greatly enriched with fishes, crustacea and testacea, results of his numerous excursions. In 1785, refusing the chair of nat. history at Padua, admirably filled by Vallisnieri, he accepted the proposal of Archduke Ferdinand to accompany, with doubled salary, the Austrian ambassador to Constantinople. He visited Naples while Vesuvius was in eruption, 1788; also the Lipari Isles and Sicily—in restless prosecution of his scientific labors; and then retired to Pavia, where he spent the remainder of his life, in scientific

SPALPEEN—SPANDAU.

researches, amid bodily sufferings, and died of apoplexy. His works, many of the more valuable translated into English, are too numerous to mention; a complete list, with biography, is in *Biographie Médicale*, VII. See also, for the result of his labors, the *Éloge*, by Alibert, in *Mémoires de la Société Médicale d'Émulation*.

SPALPEEN, n. *spál'pēn* [Ir. *spailpín*; Gael. *spailpean*, a mean conceited fellow—from Ir. and Gael. *spailp*, pride]: in *Ireland*, a mean fellow; a rascal.

SPAN, n. *spän* [Ger. *spanne*; It. *spanna*; Iceî. *spönn*; Dan. *spand*, a span: AS. *spannan*, to bind: Dan. *spænde*, to span: Dut. *spannen*, to stretch, to span]: natural measure of length, the distance between the tips of the thumb and of the little finger when extended as far as possible with the average hand—usually reckoned 9 in.: the spread of an arch: short duration: a yoke of oxen: V. to measure by the hand with the fingers extended, or by encompassing the object; to spread from one side to another, as an arch; to fetter, as a horse. SPAN'NING, imp. SPANNED, pp. *spänd*. SPAN'NER, n. *-nēr*, one who or that which spans. SPAN-COUNTER, n. *spän-kown'tēr*, in *OE.*, a game at which money was thrown within a span or mark. SPAN-ROOF, in *arch.*, a common roof having two inclined planes.

SPAN, v. *spän*: pt. of SPIN, which see.

SPANÆMIA, n. *spä-nē'mī-ă* [Gr. *spanis*, scarceness; *haima*, blood]: a diseased condition of the blood, characterized by a deficiency in its red corpuscles; the opposite condition to *plethora*. SPANÆMIC, a. *spä-nē'mīk*, having the property of impoverishing the blood; having an impoverished or thin state of blood.

SPANCEL, v. *spän'sēl* [Ger. *spannen*, to tie; *seil*, a rope]: in *prov. Eng.*, to tie the hind legs, as of a horse or cow, with a rope: N. the rope so used. SPAN'CELLING, imp. SPAN'CELLED, pp. *-sēld*, in *her.*, applied to a horse two of whose legs are fettered by a log of wood.



Spancelled.

SPANDAU, *spän'dow*: town in Prussia, province of Brandenburg, at confluence of the Havel and the Spree, 8 m. n.w. of Berlin; on the Berlin and Hamburg and the Berlin and Lehrte railroads. It is strongly fortified and is the key of the defenses of Berlin; the garrison numbers 4,000 men. In the citadel is kept the imperial war-treasure of about \$30,000,000 gold. All the works are surrounded by water, and nearly all the lands around the city can be flooded. S. is a great depot for war-material, and has numerous factories and laboratories for manufacturing cannon, small-arms, gunpowder, fixed ammunition, etc.; in these establishments 4,000 workmen are constantly employed. The civil industries of the town are unimportant. S. is one of the oldest towns in Prussia, having received town rights 1232. Pop. (1885) including garrison, 31,463; (1900) 65,030.

SPANDREL—SPANIARD.

SPAN'DREL: triangular space between the outside of



s, s, Spandrels.

an arch and a square head including it. This space is often filled with sculptured foliage, figures, etc.

SPANG, n. *spång* [for SPANGLE, which see]: in *OE.*, a very thin piece of gold or other shining material; a spangled ornament: V. in *OE.*, to adorn with spangles.

SPANGENBURG, *spång'gèn-bérg*, Ger. *spång'én-bérch*, AUGUSTUS GOTTLIEB, PH.D.: 1704, July 15—1792, Sep. 18; b. Klettenberg, Hanover: Moravian bp. He entered the Univ. of Jena 1722; studied law, then theol.; became asst. prof., and prof., but was dismissed on account of his sympathy with Count Zinzendorf, with whom he became associated 1727. In 1735 he founded a Moravian colony at Savannah, Ga., and afterward preached in Penn. He was made bp. of the Amer. Moravian churches in 1744 (or 1747), and resided at Bethlehem, Penn., 1744-61—an outpost where his influence with the Indians was much valued by the govt. He was adopted by the Iroquois on a visit to Onondaga. In 1752 he helped survey a large area in N. C. for settlement. He died in Saxony. He was indefatigable, personally winning, and has been called the Melancthon of the Moravians. He published *Idea Fidei Fraternalis* (1782), translated under the title *Exposition of Christian Doctrine*; also, *Life of Count Zinzendorf*. Some of his hymns are famous, such as *Die Kirche Christi, die Er geweiht* (The church of Christ, that he has hallowed), and *Heil'ge Einfalt*, etc. (Holy Simplicity—translated 'When simplicity we cherish,' etc.). An Eng. translation of Ledderhose's life of S. was pub. 1855.

SPANGLE, n. *spång'gl* [Ger. *spange*, a brooch, ornament: Gael. *spang*, anything shining or sparkling: Bav. *spangeln*, to sparkle: Dut. *spang*; Icel. *spöng*, a clasp, a plate of metal]: small circular plate or scale of very thin shining metal, usually silvered or gilded tin, pierced with a needle-hole so that it can be sewed upon cloth—used chiefly for decorating theatrical costume; any little thing sparkling and glittering: V. to adorn with spangles; to glitter SPANG'LING, imp. SPANG'LED, pp. *-ld*: ADJ. adorned or beset with spangles. SPANG'LY, a. *-lǝ*, glittering; glistening.

SPANIARD, n. *spän'yérd*: native of Spain (q.v.). SPAN'ISH, a. *-ish*, of or from Spain: N. the language of Spain. SPANISH-FLY, a winged beetle, collected in large quantities, and used for raising blisters; cantharides (see CANTHARIS). SPANISH-JUICE, licorice. SPANISH FERRETO, *fér-ré'tō*, a rich reddish-brown color obtained by calcining copper and sulphur together.

SPANIEL—SPANISH-AMERICAN WAR.

SPANIEL, n. *spän'yěl* [F. *épagneul*; OF. *espagneul*, a spaniel—from Sp. *español*, Spanish: Sp. *España*; L. *Hispania*, Spain]: *literally*, a Spanish dog; sporting-dog remarkable for sagacity and fawning: hence, a mean cringing person.—The Spaniel is of many breeds, which differ considerably in size and other characters. All are characterized by large pendulous ears, long silky hair, often curly and shaggy, and acute scent. None are large; some are among the smallest of dogs. All are lively, playful,



Spaniel.

docile, and affectionate in a high degree. The S. is ever petitioning for regard, and shows boundless joy on receiving kind attention. The ENGLISH or SUSSEX S. is of elegant but moderately stout form; with very large pendent ears, of which the hair is very long; muzzle rather broad; tail bushy, body covered with long silky hair; colors various, very often liver-colored and white, or red and white. In the days of falconry, spaniels were much used for starting the game. The Cocker (q.v.), the Springer (q.v.), and the Blenheim Dog (q.v.) are different kinds of spaniels.—The KING CHARLES'S S. is a beautiful black-and-tan breed, almost as small as the Blenheim dog, and is named from Charles II., who delighted in dogs of this kind.—The WATER S. is one of the larger breeds. It has comparatively hard hair, and is distinguished by its readiness to pursue game by swimming: it is much used in decoy-ponds to drive ducks into the net.

SPANISH-AMERICAN WAR, 1898, April 21—Aug. 12, was due to Spain's inability to subdue the state of insurrection which existed in the island of Cuba from 1895, and her refusal to grant the colony its absolute freedom. The popular sentiment of the United States favored the Cuban insurgents who were waging a war for independence with a small army and scarcely any munitions of war. Notwithstanding the vast superiority, both in number and equipment, of the Spanish troops over their antagonists, the Spanish captains-general found the subjugation of the revolted Cubans a hopeless and impossible task. The humane Marshal Campos, who, as Captain-General at the outbreak of the insurrection, strove to terminate it by pacific measures, was quickly recalled by the home government for lack of energy, and in 1896, Jan., was

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succeeded by Gen. Valeriano Weyler, who immediately inaugurated a policy of fire and sword wherever his troops could penetrate. By adopting this policy he hoped to starve the revolted Cubans into submission, but the only result was the herding together of all the inhabitants of the outlying districts around fixed military zones, after having burnt their dwellings and destroyed their property, and having little or no food to give them, they died by thousands of starvation and disease. Although Gen. Weyler had undertaken to end the insurrection in a few months, he succeeded in occupying only certain restricted portions of the island and reconcentrating the starving Cubans. The condition of the natives caused widespread indignation throughout the United States and led to a strong diplomatic remonstrance, the ultimate result of which was the recall of Weyler and the promise of a more humane policy toward the "reconcentrados," as the peniless inhabitants huddled together to starve at the military posts were called. Marshal Ramon Blanco, who had been Governor of the Philippines, was appointed to succeed Weyler, and set about to institute a form of autonomous government. But the reforms were not acceptable; the Cubans wanted nothing short of that independence for which they had fought so stubbornly.

In 1896, Feb., Congress took official cognizance of the state of affairs in Cuba, and after a protracted debate resolved (April 6) to grant the Cubans recognition as belligerents, and offered the friendly offices of the United States for the recognition by Spain of the independence of Cuba. Although when he took office Blanco issued a proclamation of amnesty, the insurgents disregarded it, and fighting continued.

The year 1898 opened with the war unsuppressed, and the irritation in the United States over the killing by starvation of hundreds of "reconcentrados" increased. Its effect intensified the feeling of the Spaniards against America, and the volunteers and rougher element openly demonstrated their animosity. The life of the consul-general at Havana was threatened, and, so that American interests and human life might be adequately protected, President McKinley ordered a war vessel to Havana harbor, ostensibly on a friendly visit, but no doubt as a protective step. The request of the Spanish Government for the recall of Consul-General Lee, which was refused, and the publication of a letter containing insulting references to the President, written by the Spanish Minister, Señor De Lome, increased the tension, which was further intensified by the destruction in Havana harbor, Feb. 15, of the battleship *Maine* and 266 of her crew.

This awful calamity was generally regarded by the American people as an act of treachery, and soon after the war spirit arose. By the time the verdict of the Court of Inquiry appointed to investigate the destruction of the *Maine* had been published, Congress had passed unanimously a bill to appropriate \$50,000,000 for national defense. By April 10 all American consuls had been

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recalled, and on the 18th the following resolution was passed by Congress:

“Whereas, The abhorrent conditions which have existed for more than three years in the island of Cuba, so near our own borders, have shocked the moral sense of the people of the United States, have been a disgrace to Christian civilization, culminating as they have in the destruction of a United States battleship with 266 of its officers and crew, while on a friendly visit in the harbor of Havana, and cannot longer be endured, as has been set forth by the President of the United States in his message to Congress of April 11, 1898, upon which the action of Congress was invited; therefore,

“Resolved, By the Senate and House of Representatives of the United States of America, in Congress assembled:

“First—That the people of the Island of Cuba are, and of right ought to be, free and independent.

“Second—That it is the duty of the United States to demand, and the Government of the United States does hereby demand, that the Government of Spain at once relinquish its authority and government in the island of Cuba, and withdraw its land and naval forces from Cuba and Cuban waters.

“Third—That the President of the United States be, and he hereby is, directed and empowered to use the entire land and naval forces of the United States, and to call into the actual service of the United States the militia of the several States, to such extent as may be necessary to carry these resolutions into effect.

“Fourth—That the United States hereby disclaims any disposition or intention to exercise sovereignty, jurisdiction, or control over said island, except for the pacification thereof, and asserts its determination when that is completed to leave the government and control of the island to its people.”

It was signed by the President April 20, and a copy was served on the Spanish minister, Polo y Bernabé, who asked for his passports and left Washington. On the 21st the Spanish authorities at Madrid sent the American minister, Gen. Woodford, his passports, which act practically constituted a declaration of war. Congress immediately passed an act to increase the naval and military strength, and the President notified the neutral powers of the war. Great Britain formally notified Spain that coal would be considered contraband of war, and on the 22d the American fleet sailed from Key West to blockade the Cuban ports. The President issued a call for 125,000 volunteers April 23, and two days later Congress passed an act declaring that war had existed between Spain and the United States since April 21. Great Britain issued a proclamation of neutrality April 24, and was followed by the powers, with the exception of Germany, a few days later.

The first prize of the war, the *Buena Ventura*, a Spanish ship, was captured by the U. S. gunboat *Nashville*, April 22. On the 27th the batteries of Matanzas were shelled, and Cienfuegos and Cardenas were attacked a few days

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later and the cables cut. In the meantime the Asiatic squadron, under Commodore Dewey, had captured Cavité and destroyed the Spanish Pacific fleet, May 1. (See DEWEY, GEORGE.) Eleven days later San Juan de Porto Rico (q.v.) was bombarded by Admiral Sampson, and a flying squadron was organized to discover the whereabouts of Admiral Cervera and the Spanish Atlantic fleet. Having eluded the American ships, Cervera reached Santiago May 19, and on the 30th was found there by Admiral Sampson, who immediately shelled the forts commanding the harbor.

To make it impossible for the Spanish fleet to escape, Lieutenant Hobson, under orders from Admiral Sampson, sank the American collier *Merrimac* at the entrance of Santiago harbor June 3, but was taken prisoner. The Spanish cruiser *Reina Mercedes* was sunk by the blockading fleet off Santiago harbor June 6, and a few days later marines from the fleet were landed at Guantanamo (11th). They skirmished with the enemy the following day, when reinforcements set sail from Key West. The fighting between the marines and Spaniards continued throughout the 14th and 15th, being supplemented by the bombardment of Caimanera by the warships. The Ladrone Islands were seized June 21 by an American squadron on its way to Manila with reinforcements. Juragua was taken the 24th, and the Spaniards also suffered defeat at Las Guasimas. But the second brilliant achievement of the war occurred July 1-2, when the Spanish earthworks at El Caney and San Juan, Santiago, were carried by assault with heavy loss. The 71st New York and the "Rough Riders," a cavalry regiment organized by Gov. Theodore Roosevelt of New York and commanded by Colonel Wood, with himself as lieutenant-colonel, participated in the assault. On the following day Admiral Cervera, whose fleet had remained inactive in the harbor of Santiago, put to sea, and a running fight between the United States squadron and the Spaniards, who were trying to escape, took place (July 3), in which not a single Spanish vessel escaped, every one being sunk or driven ashore and destroyed. Five days later Admiral Dewey captured Isla Grande, in Subig Bay, near Manila.

In the meantime operations on land progressed so satisfactorily that on July 3 the surrender of Santiago was demanded by Gen. Shafter, but refused by Gen. Toral, and the bombardment continued; but the city held out only a few days longer, and surrendered July 17. The last naval engagement on the Cuban coast occurred in the harbor of Nipe, which was entered and shelled by four American warships, and eventually surrendered.

The investment and impending fall of Manila compelled the Spanish government to make overtures for peace, and a peace protocol was signed Aug. 12, and an armistice declared, but Manila surrendered the next day. A peace commission was appointed by the President Sept. 9, which met the Spanish commissioners in Paris Oct. 1, and after long and earnest conferences Spain accepted the terms of

SPANISH GRASS.

the United States, and the treaty of peace was signed Dec. 10 at 8.45 P.M. Its provisions were as follows:

Article 1 provides for the relinquishment of Cuba.

Article 2 provides for the cession of Porto Rico.

Article 3 provides for the cession of the Philippines for \$20,000,000 as compensation.

Article 4 embraces the plans for the cession of the Philippines, including the return of Spanish prisoners in the hands of the Tagalos.

Article 5 deals with the cession of barracks, war materials, arms, stores, buildings, and all property appertaining to the Spanish administration in the Philippines.

Article 6 is a renunciation by both nations of their respective claims against each other and the citizens of each other.

Article 7 grants to Spanish trade and shipping in the Philippines the same treatment as American trade and shipping for a period of ten years.

Article 8 provides for the release of all prisoners of war held by Spain and of all prisoners held by her for political offences committed in the colonies acquired by the United States.

Article 9 guarantees the legal rights of Spaniards remaining in Cuba.

Article 10 establishes religious freedom in the Philippines and guarantees to all churches equal rights.

Article 11 provides for the composition of courts and other tribunals in Porto Rico and Cuba.

Article 12 provides for the administration of justice in Porto Rico and Cuba.

Article 13 provides for the continuance for five years of Spanish copyrights in the ceded territories, giving Spanish books admittance free of duty.

Article 14 provides for the establishment of consulates by Spain in the ceded territories.

Article 15 grants to Spanish commerce in Cuba, Porto Rico, and the Philippines the same treatment as to American for ten years, Spanish shipping to be treated as coasting vessels.

Article 16 stipulates that the obligations of the United States to Spanish citizens and property in Cuba shall terminate with the withdrawal of the United States authorities from the island.

Article 17 provides that the treaty must be ratified within six months from the date of signing by the respective Governments in order to be binding.

Under the supervision of the evacuation commissioners, the removal of the Spanish troops from Cuba and Porto Rico began immediately after the arrival of the American commissioners in those islands. The complete evacuation of Porto Rico was accomplished by Oct. 17, and on Oct. 18 the United States flag was hoisted at San Juan, and the United States came into formal possession of the island.

The evacuation of Cuba by the Spaniards progressed in Dec., 1898, and was completed Jan. 1, 1899.

SPANISH GRASS: see ESPARTO: PAPER.

SPANISH LANGUAGE AND LITERATURE.

SPANISH LANGUAGE AND LITERATURE: one of the Romanic family of languages—and its literature. The Spanish language (which comprises three principal dialects—Portuguese-Galician, Castilian, and Catalan), like the other Romanic tongues, originated in the *lingua Romana rustica*: see ROMANIC LANGUAGES. The earliest of the Spanish dialects to assume a literary form was the Castilian, which gradually became, and has continued, the classic dialect of the nation. It is spoken throughout central Spain; and the course of Spanish conquest led to its establishment also in Mexico, Central America, Cuba, Porto Rico, the greater part of S. America, the Canary Islands, and the Philippines. The Catalan dialect is spoken in the provinces of Gerona, Barcelona, Tarragona, and Lerida, Castellon de la Plana, Valencia, and Alicante, and in the Balearic Isles. The Galician dialect (closely allied to Portuguese) is confined to the provinces of Pontvedra, Coruña, Orense, and Lugo. The Catalan is allied most closely to Provençal; the Castilian (and still more the Galician) is more akin to Portuguese.

Literature.—The literature of Spain may, in a superficial sense, be regarded as beginning under the auspices of the Romans; for the poets Lucan, Martial, Silius Italicus; and the philosophers and historians, Seneca, Quintilian, Columella, Florus, Pomponius Mela, and other eminent Latin authors, were at least Spanish by birth; and perhaps the Christian ecclesiastical writers of the Gothic period constitute the second link in the historical chain. But in the proper sense of the term, the literature of these two periods is no more *Spanish*—i.e., national—than an English book by an Anglo-Indian is a portion of Hindu literature; or than the sermons preached by a missionary to South Sea Islanders are to be quoted as specimens of the literature of the Pacific. Passing over, then, the various developments of non-national literature in Spain—pagan Latin, ecclesiastical Latin, Arabic, and Jewish—we come to the 12th c., and then, for the first time after the gradual formation of a Spanish language, begin to notice the growth of something like a Spanish literature. Epic and didactic poems appear, in Castilian verse, and full of national sentiment. The oldest of these is the *Mystery of the Magian Kings*, a sort of liturgical drama intended to be acted in the Church of Toledo on the feast of Epiphany: it was composed about 1150. Of this piece some fragments are extant. Next after this come two poems on the hero Rodrigo Diaz de Bivar, the Cid (see CID CAMPEADOR), neither of which has been preserved entire: these poems were composed within 100 yrs. after the death of the Cid, or in the last quarter of the 12th c. To the same century or the beginning of the 13th are referred sundry religious and didactic poems, among them Gonzalo de Berceo's *Miracles*, and his *Praises of the Virgin*. Other poems of this period are: *The Book of Apollonius*, *Prince of Tyre*; *The Life of St. Mary of Egypt*; *The Adoration of the Three Holy Kings*; and the poem *Count Fernan Gonzalez*, which, like the *Poema del*

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Cid and the *Gesta del Cid*, paints the earnest and picturesque struggle between the Moors and Spaniards. In all these, we trace the influence either of the church or of the chivalric poetry of France; but they maintain, nevertheless, a distinctively national and independent character. A great impulse was given to the artistic development of Spanish literature by Alfonso X. (the Wise) of Castile (q.v.), who substituted Spanish for Latin in the courts of law, and fostered in many ways the growth of the national language. He is regarded as the founder of Spanish prose, his chief work in this department being the compilation of a series of codes, of which the most memorable is *Las Siete Partidas*. He wrote or compiled books also on astronomy, and histories—*General é Grant Historia*, and *Crónica de España*. Subsequent princes walked in his steps, and achieved honorable reputation both as authors and as patrons of literature, conspicuous among whom was the Infante Don Juan Manuel (d. 1347), whose *El Conde Lucanor* (Count Lucanor) is a collection of 49 tales, apologies, etc., from oriental sources, and wearing an oriental aspect; he wrote also *Libro de los Estados*, a manual of education, domestic economy, and politics. The most remarkable Spanish poet of the 14th c. is Juan Ruiz, arch-priest of Hita (d. 1350). His pieces, composed in a great variety of measures, number about 7,000 verses—religious and love songs, fables, pastorals, etc. The didactic tendency is visible particularly in the *Danza general de la Muerte* (Dance of Death).

The *second* period of Spanish literature embraces the later middle ages, and is marked by the presence of lyric poetry in considerable quantity, with the didactic. It seems to have been inspired by the strains of the Provençal poets settled at the court of the Counts of Barcelona, and always continued to be more courtly than national. The most complete collection of this lyric poetry is the *Cancionero general* of Fernando del Castillo (Valencia 1511; 10th ed. 1573), which contains the names of 136 authors; among whom are the Marquis of Villena and the Marquis of Santillana, the three Manriques, Macías, Sanchez de Badajoz, Alonso de Cartagena, Diego de San Pedro, and Fernan Perez de Guzman. Against this court-poetry, however, a strong reaction took place, the national spirit reasserting itself vigorously in ballads, chronicles, romances of chivalry, and the drama. The best collection of the ballads (about 1,000 in all) is in *Romancero general* (13 vols. 1605–14); of the chronicles (half-genuine, half-fabulous narratives of ancient Spanish heroes), the best are those of Ayala, of Juan Nuñez de Villaizan, the *Chronicle of the Cid*, and the *Chronicle of the Travels of Ruy Gonzalez de Clavijo*; of the romances of chivalry, the most celebrated is the *Amadis de Gaul*, parent of innumerable others (see AMADIS); and of the drama, among the first specimens are the pastoral plays of Juan de la Enzina, and the *Celestina* of Fernando de Rojas.

The *third* period, from the 16th to the 18th c., is the most splendid and productive in the annals of Spanish liter-

SPANISH LANGUAGE AND LITERATURE.

ature. Under Charles V., Spain became the foremost state in Europe, and the conquest of Naples brought it into close relation with the literature of Italy. The great Italian masters, as Dante and Petrarch, began to be studied, and Italian measures and poetic forms to be imitated, though the rich, strong, Spanish spirit is never lost. The first of this new school was Juan Boscan Almogaver (d. 1543), brilliant sonneteer; other members of the same school are Garcilaso (q.v.) de la Vega, Diego Hurtado de Mendoza (q.v.), Francisco de Saa de Miranda, and Jorge de Montemayor (author of the once famous pastoral novel of *Diana*—see NOVELS), Fernando de Herrera (q.v.), and Luis de Leon (d. 1591), the last two of whom rank as the two greatest lyric poets of Spain. Gradually, a national drama established itself. Conspicuous in this department are Villalobos; Perez de Oliva; and Naharro (about 1517), sometimes regarded as the father of the Spanish drama. The last-mentioned wrote his comedies in the favorite national measure, the *redondillas*, and divided them into three acts. Besides these were Lope de Rueda, Juan de la Cueva, Geronimo Bermudez, and others, who cultivated tragedy with success. Among most eminent prose writers of the first section of this third period were Geronimo Zurita, author of *Annales de la Corona de Aragon* (Annals of the Crown of Aragon, 6 vols.)—a somewhat critical work, showing decided advance on the credulous chronicles of the monks; Oliva, whose *Dialogo de la Dignidad del Hombre* (Dialogue on the Dignity of Man) is a fine specimen of elegant literature; and Morales, author of *Discursos* (Essays), relating to practical philosophy, etc.—Cervantes (q.v.) marks, if not exactly a new era, at least a splendid outburst of Spanish genius. It is unnecessary here to criticise the productions of his genius; we only note the fact that his immortal *Don Quixote* put an end to the romances of chivalry—or rather to the extravagant imitations of these that sprang up after the age of chivalry had passed away. Lope de Vega (q.v.), contemporary of Cervantes, and Calderon (q.v.) gave the national drama a European renown, and had, especially the latter, a host of followers more or less celebrated; among whom are Francisco de Rojas, Agustin Moreto, Frago, Diamante, Antonio Hurtado de Mendoza, Juan de la Hoz, Antonio de Solis, and Agustin de Salazar y Torres. The lyric and ‘epic’ poets of this period, which embraces the second half of the 16th and the whole of the 17th c., are innumerable, but not great. The most notable names are those of the brothers Argensola, and Alonso de Ercilla y Zuñiga (author of *Araucana*, fine poem on the conquest of Araucania in Chili by the Spaniards). A peculiar form of the novel also appeared, called the ‘rogues’ novel,’ of which the only memorable specimen is the *Guzman de Alfarache* of Mateo Aleman; and even it derives not a little of its importance from the fact that it suggested Le Sage’s *Gil Blas*. In history, the most distinguished names are those of Mariana (q.v.) and Solis.

The *fourth* period of Spanish literature extends from the

SPANISH LANGUAGE AND LITERATURE.

accession of the Bourbons (1701) to the present time; and was long marked (like the contemporary literature of Germany) by a servile imitation of French models, and these by no means the best of their kind. This literary ascendancy of France in the first half of the 18th c. over all civilized Europe is a very curious phenomenon, worthy of closer study than it has yet received. The most notable of the Frenchified Spaniards was Ignacio de Luzan, whose *Poetica* (1737) is a thoroughly Gallican performance. His efforts to denationalize the literature of Spain were combated by Garcia de la Huerto and others, and at length a sort of compromise was effected, and the 'Salamanca School' emerged into notice. Its founder, Melendez Valdez (b. 1754), was a man of high genius, who subordinated his liberal culture to the sovereign control of a patriotic inspiration; and the same qualities are visible in its other members—Iglesias, Noroña, Quintana (q.v.), Cienfuegos, Arriaza, and Gallego. The great Peninsular war, and the subsequent political movements in Spain, had a powerful effect in stirring up anew the elements of nationality, and the 19th c. can show a lengthened list of names both in prose and poetry.

Only a few of the names most distinguished in recent Spanish literature can be given here. The following poets most clearly exhibit the quickening effect of the national strife on the popular thought: Xérica, Lista, Martinez de la Rosa, José Joaquin de Mora, Angel de Saavedra, Breton de los Herreros. Of the poets who in more recent times have infused into Spanish literature a new life may be named: Espronceda, Serafin Calderon, Zorrilla, Hartzenbusch, R. de Campoamor, Santos Lopez Pelegrin, Villergas, Gertrudis Gomez de Avellaneda, Arnao, Gil, Campo-Arana, José Gonzalez de Texada (satirist); and the lyrists Antonio de Trueba, Gaspar Bueno Serrano, and especially Ventura Ruiz Aguilera and Nuñez de Arce. The most noteworthy dramatists are Leandro Fernandez Moratin, with Martinez de la Rosa, Saavedra, and others above named. In romantic fiction the most eminent names are Escosura, Martinez de la Rosa, Larra, Maria del Pilar, and 'Fernan Caballero.' Of writers of history there are: Ulloa, Muñoz, Capmany, Ferreras, Quintana, Navarrete, Clemencin, Balmes, Torreno, Muñoz Maldonado. Jovellanos, Arguelles, Miñano, Marina, Donoso Cortes, Martinez de la Rosa, and Castelar have excelled in political oratory. The most notable works in philosophy and criticism are those of Gallardo, Salvá, Lista, Hermosilla, Marchena.

Spain has not yet achieved great results in any departments of science, physical, mental, or moral; but of late years she has turned her attention seriously to scientific studies, and several admirable treatises in jurisprudence, political economy, medicine, philosophy, philology, and geography have been produced.—See Bouterwek's and Sismondi's *Histories of Spanish Literature*; and above all, Ticknor's work on the same subject (3 vols. New York 1849-54), which has been translated into Spanish.

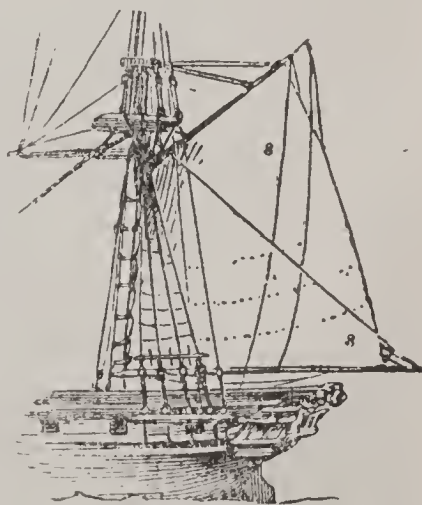
SPANISH MACKEREL—SPANK.

SPANISH MACKEREL (*Scomberomorus maculatus*): fish allied to the common mackerel (*Scomber scombrus*); but differing from it in having the back lead-color, without wavy bands, and the side marked with 25-30 spots; also in having 8 finlets between the second dorsal fin and the tail, instead of 5. Though very abundant, in some years especially, at a considerable distance from shore, it is not so readily taken in large quantities as the common mackerel; and this, with its superior excellence as food, gives it the high average price of 60 cents a lb. in New York (1891, Oct., 75 cents). It sometimes weighs 8-9 lbs., but rarely exceeds 3-4. It ranges from the West Indies to Me., appearing s. in early spring, and in July off New York.—Of the same genus are the Cero (*S. caballa*), with 14 1st-dorsal spines, and no spots, except yellowish when young; the Spotted Cero (*S. regalis*), with a spot of deep blue on the white 1st dorsal; and the Monterey Mackerel (*S. concolor*), which is high-priced.—In England, the name S. M. is given to the Chub, Bull, Big-eyed, or Mixed Mackerel, or Thimble-eye (*Scomber colias*), which has wavy bands broken into spots on the side. It sometimes appears in schools on our coast, and is thought by some to be identical in a younger stage with *S. pneumatophorus* of the Mediterranean, and *S. Diego* of Cal.; the lower half of its sides lacks the gray spots.

SPANISH MAIN (i.e., *main-land*): term formerly denoting the n.e. coast of S. America, from the Orinoco to the Isthmus of Darien; also the contiguous s. portion of the Caribbean Sea, traversed by the Spanish treasure-ships: the term is frequent in connection with the history and exploits of Buccaneers (q.v.).

SPANISH TOWN: seat of govt of the British possession of Jamaica (q.v.), on the right bank of the Cobre, 10 m. w. of Kingston. It contains several important public institutions, but is ill built and unhealthful. Pop. about 6,000.

SPANK, n. *spångk* [W. *ysponc*, a smack, a skip or quick bound: Low Ger. *spenkern*, to run and spring about]: a sounding blow with the open hand: V. to strike with the open hand. **SPANK'ING**, imp.: ADJ. dashing; free-going; strong; large. **SPANKED**, pp. *spångkt*. **SPANKER**, n. *spångk'ér*, something very large, or larger than common; a large quadrilateral sail with parallel sides set between the gaff and boom of a ship, and having its foreleech attached by rings to the mast. The spanker is a fore-and-aft sail of great importance in bringing the vessel to the wind. **SPANKING BREEZE**, forcible breeze.



s. s, Spanker.

SPANNER—SPARE.

SPANNER, n. *spǎn'nér* [see SPAN 1]: an iron tool used to tighten the nuts of screws.

SPAN-NEW, a. *spǎn'nū* [Icel. *spánn*; Ger. *span*, a chip, and Eng. *new*]: quite new; brand-new; as new as a fresh chip.

SPAR, n. *spár* [AS. *spæren*, gypsum: Ger. *spath*, spar]: a term applied to any bright crystalline mineral, and adopted by mineralogists in the names of a number of minerals—e.g., calcareous S., fluor S.; though in these the term has no proper generic significance. **SPAR'RY**, a. -rǐ, resembling spar, or consisting of spar; having a confused crystalline structure.

SPAR, n. *spár* [Dut. *spar*, a rod: Ger. *sparren*, a rafter: Dan. and Sw. *sparre*, a bar, rafter: Ir. and Gael. *sparr*, a joist]: any long round piece of timber, as a mast, a yard, a boom, etc. **SPAR-DECK**, the upper deck of a vessel, especially a frigate, on which spare spars are usually placed.

SPAR, v. *spár* [AS. *sparrian*, to shut (see SPAR 2)]: to close or fasten with a spar; to bar. **SPAR'RING**, imp. **SPARRED**, pp. *spárd*.

SPAR, v. *spár* [a metaphor from cock-fighting, when the cock has its *spurs* covered to embolden it to fight: OF. *esparrer*, to fling or jerk out with the heels: Low Ger. *sparre*, a struggling, striving]: to fight in show, or as preparatory to a real contest, as a pugilist; to box in gloves; to wrangle; to quarrel in words: N. a feigned blow; a contention with the fists. **SPAR'RING**, imp.: N. the act of fighting in show, as a pugilist. **SPARRED**, pp. *spárd*. **SPAR'ER**, n. -rér, one who spars.

SPARABLE, n. *spär'ä-bl* [corruption of *sparrow-bill*, so called from its shape: comp. Gael. *sparrag*, a nail, a rivet]: a small nail used by shoemakers for putting into the soles and heels of shoes to make them wear longer. *Note.*—The literal meaning of **SPARABLE** may be simply, that which *spars* or *rivets*: see SPAR 3.

SPARADRAP, n. *spär'a-dräp*, or **SPARADRAB**, n. *spär'a-dräb* [F.]: in *phar.*, an adhesive plaster spread on linen or paper; a cerecloth.

SPARE, a. *spär* [Icel. *spara*; Ger. *sparen*; L. *parcēre*, to spare: AS. *spær*; Icel. *sparr*; L. *parcus*, sparing]: scanty; frugal; not abundant; held in reserve; not required for present use; lean: V. to refrain from using, taking, or doing something; to part with willingly; to do without; to treat with tenderness or forbearance; to live or use frugally; to save from any particular use; to exercise forbearance; to treat with pity; not to afflict; to forbear. **SPAR'ING**, imp.: **ADJ.** scanty; frugal; chary; penurious: N. in *OE.*, parsimony. **SPARED**, pp. *spárd*. **SPARE'LY**, ad. -lǐ, or **SPAR'INGLY**, ad. -lǐ, moderately; not lavishly; not abundantly; cautiously; tenderly. **SPAR'INGNESS**, n. -nēs, the quality of being sparing; parsimony. **SPARE'NESS**, n. state of being spare; leanness. **SPARE-RIB**, a piece of the side of a pig, consisting of ribs with little flesh on them.—**SYN.** of 'spare, v.': to omit; forbear; grant; allow; indulge; save;

SPARGE—SPARKS.

—of 'spare, a.': lean; meagre; thin; parsimonious; superfluous; scanty;—of 'sparing, a.': scarce; little; scanty; parsimonious; chary; merciful.

SPARGE, v. *spárj* [L. *spargĕrĕ*, to scatter, to throw about]: in *brewing*, to throw water upon in a shower of small drops, that it may percolate equally through a mass. SPAR'GING, imp. SPARGED, pp. *spárjd*. SPARGER, n. *spár'jér*, a vessel with a perforated bottom, used for dashing or sprinkling water.

SPARIDÆ, *spär'ĭ-dē*: family of acanthopterous fishes, having general resemblance to the Perch family—a single dorsal fin, not protected by any scales, and whose anterior rays are spinous, the pectoral and ventral fins sharp-pointed, the tail-fin notched; the gill-cover shining, without proper spines or denticulations; the palate destitute of teeth; the scales large, broader than long, and generally thin. There are several sections of the family, distinguished by the teeth, which in some are all small and card-like, while others have trenchant, conical, and round molar teeth, variously arranged. The greater number inhabit the seas of warm parts of the world; many species are found in the Mediterranean; a few on the coasts of Britain: see GILTHEAD. Several Brit. species of different genera are known by the common name Sea Bream (q. v.). The S. are generally good for food; some are highly esteemed—among them the *Sargus* of the Mediterranean (*Sargus Rondeletii*), much valued by the ancient Romans, and the Porgy, the Scup, and the Sheepshead of the N. American seas. Of the American fishes of this family, the Sheepshead (*Diplodus probatocephalus*) is highly esteemed as a food-fish.

SPARK, n. *spârk* [Lith. *spragĕti*, to crackle, as fire-wood on the fire: Dan. *sprage*; Icel. *spraka*, to crackle (see SPRAG 2)]: a small piece of ignited matter which crackles and flies off from a body during combustion; a small portion in a state of activity, as of life; a gay young fellow; a brisk showy man; a lover. SPARKLE, v. *spâr'kl*, to fly off in sparks; to glitter; to exhibit an appearance of animation, as the eyes; to emit little bright bubbles, as liquors: N. a little spark; a slight ebullition, as of temper; a gleam; brightness. SPAR'KLING, imp. *-klĭng*: ADJ. bright as a spark; glittering; lively. SPAR'KLED, pp. *-kld*. SPAR'KLER, n. *-klĕr*, he or that which sparkles. SPAR'KLINGLY, ad. *-lĭ*, with vivid and twinkling lustre.—SYN. of 'sparkle, v.': to beam; gleam; glimmer; ray; glitter; shine; glisten; scintillate; coruscate; radiate.

SPARKS, *spârk*s, JARED, LL.D.: American historian: 1789, May 10—1866, Mar. 14; b. Willington Conn. He graduated at Phillips Exeter Acad.; and at Harvard Coll. 1815; became tutor in mathematics and nat. philosophy at Harvard, and one of the conductors of the *North American Review*. In 1819, having studied at the Harvard Divinity School, he was settled as a Unitarian minister at Baltimore, when he wrote *Letters on the Ministry, Ritual, and Doctrines of the Protestant Episcopal Church*. In 1821 he es-

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established a periodical, the *Unitarian Miscellany and Church Monitor*, in which he published his *Letters on the Comparative Moral Tendencies of the Trinitarian and Unitarian Doctrines*. In 1823 he edited six volumes of essays and tracts on theological subjects, and, abandoning the pulpit, became for seven years sole editor of the *North American Review*. In 1828 he published a *Life of John Ledyard, the American Traveller*; and 1834-37 edited at Boston 12 octavo vols. of the *Writings of George Washington*. This important national work was followed by *Diplomatic Correspondence of the American Revolution* (13 vols. 8vo, Bost. 1829-30), and the *Life of Gouverneur Morris* (3 vols. 8vo, Bost. 1832). At this period he commenced the *American Almanac of Useful Knowledge*, and began also his *Library of American Biography*, issued first in two series of 10 and 18 vols. 18mo. In 1840 was published his collection of the *Works of Benjamin Franklin* (10 vols. 8vo), after which he visited Europe to collect materials for his *Correspondence of the American Revolution* (4 vols. 8vo, 1854). He wrote 1852 two pamphlets in answer to Lord Mahon, who had sharply criticised the *Life of Washington* and other works, for S.'s evident process of refining and exalting the style of the letters quoted—including even the substitution of elegant for objectionable terms: no charge of change of meaning was involved.—Besides these multifarious literary labors, combining laborious research with clear arrangement, a simple style, and accurate statement, S. filled in Harvard, 1839-49, the M'Lean chair of history, and from 1849 to his departure in ill health for Europe 1853, Feb., was pres. of Harvard College.

SPARLING, n. *spâr'ling* [Ger. *spierling*]: a smelt.

SPARROW, n. *spâr'rō* [Goth. *sparva*; Icel. *spörr*; Dan. *spurv*; Ger. *spërling*, a sparrow]: genus of birds (see below). SPARROW-GRASS, corruption of ASPARAGUS (q.v.). SPARROW-HAWK, species of small short-winged hawk (see below).

SPAR'ROW: common name for many species of birds, of family *Fringillidæ*; having a strong conical bill, adapted to seed-eating, the primaries nine, and the tarsus not scutellate behind. The Common S., or House S. (*Passer domesticus*), plentiful everywhere in the British Islands, is found also throughout Europe, abounding particularly in the n. countries, from which its range extends e. into Siberia, and s. to n. Africa and n. India.

In the United States this species, which should be called the European House Sparrow, is known as the English S. It was imported by Nicholas Pike and other directors of the Brooklyn Institute 1850, for the destruction of caterpillars; after which there was a 'craze' of importation and distribution, until at the end of 36 years it had overspread the country to Fla. on the s., and w. to central Kan. and Neb., with colonies in Ut. and Cal., a total of 885,000 sq. m., besides 148,000 sq. m. in Canada—its diffusion helped much by grain-cars and grain scattered on railroad tracks. Its broods are 4-6

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a season, each numbering 4-7 eggs; the rate of increase was 50,000 a year in the U. S. 1888; and is always increasing by rapid geometric ratio. Since 1880 it has been generally recognized as one of the greatest manifold pests of all animals in this country, stripping trees of buds, destroying vines and trees by its corrosive filth, plucking fruit-germs from blossoms, ruining fruit by pecking, devouring small fruits and grain and valuable seeds, plucking young and tender vegetables, stripping cedar or other bark for its enormous nests, choking roof gutters and pipes, even causing fires by combustible material, defacing buildings and statues, etc., and driving away our native birds, such as bluebirds, martins, wrens, orioles, etc.; its various offenses, however, varying somewhat with locality. Only its young in the nest and for a week after leaving it are fed on insects, numerous dissections proving that the mature bird is of no value as an insect-destroyer. Laws looking to its repression or extermination (the latter now impossible) have been passed by Mass., Mich., N. J., N. Y., Ohio, Penn., and R. I.—Ohio offering a 1-cent bounty per head, and N. Y. making it a misdemeanor to give food or shelter to the bird. In Albany, many were bought for the markets at \$1 per hundred, and elsewhere they have been sold as reed-birds for pot-pie; but to be in desirable condition they should be captured and for a few days fed on meal. In the cities they live much on horse excrement. In Australia and New Zealand they have been introduced, and are a great scourge. For means of destruction, and for an exhaustive discussion, see the bulky bulletin of the U. S. dept. of agri., *The English Sparrow*, 405 pp. (1889); also *The House Sparrow*, by T. G. Gentry (1878), and *On the Present Status of Passer Domesticus in America*, etc., by Elliot Coues (1879). Much has been published condemnatory of this bird in England, even before its introduction to this country; but in Europe it has natural checks to great increase, which, as in the case of many of our foreign weeds, and of introduced rabbits in Australia, are needful to prevent enormous multiplication.

The Tree S. (*P. montanus*), the only other British species, is very similar to the Common S., but rather smaller. It is widely distributed over great part of the old world, though rarely seen in towns.—In Italy the Common S. is rare to the s. of Piedmont; and another closely allied species (*P. cisalpina*) takes its place, very similar in habits and in characters.

In N. America, the species that happen to be *named* sparrows, instead of finches, etc., are the following, all more or less decidedly spotted or streaked: the Yellow-winged S. and the smaller Henslow's S., with edge of wing conspicuously yellow, the latter species not common; the rare similar Leconte's S., in Missouri river region and Tex.; the Savanna S., of wide distribution, with edge of wing yellowish, and its long-billed congener, the Sea-shore S., without the yellow; the Song S. and its varieties, the breast with a central blotch, and the body everywhere streaked, without yellow; the Swamp S., with wings edged with bright bay;

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the Tree S. (not the same as the European), with an obscure blotch on the breast, which is not streaked in the adult; the familiar Chipping S.; the Field S., of the size of the Chipping S., but the ashy parts of the latter replaced by pale brown; the western Clay-colored S. and Black-chinned S.; the rusty-red Fox S.; and the following (even larger than the Fox S.), all with two white wing-bars, and head more or less black: the White-throated S., edge of wing yellow; the White-crowned S., the head with medium broad white stripe; the Pacific coast Golden-crowned S.; and the Harris S. of the Missouri river region, with whole crown, face, and throat black.—The bird called S. in the Eng. translation of the Bible is a species of thrush.

SPARROW-HAWK (*Accipiter* or *Nisus*): genus of *Falconidæ*, ranked among the *ignoble* birds of prey (see FALCONIDÆ: FALCONRY). The bill is curved from the base, short, and compressed; its upper ridge rounded and narrow; the cutting margin of the upper mandible with a distinct festoon. The wings are short; the legs long, slender, and smooth. One species is British—the COMMON S. (*A. nisus*, *A.* or *N. fringillarius*), a small hawk, only about 12 inches in length, a considerable portion of the



Sparrow-hawk (*Accipiter nisus*).

length belonging to the tail. It is found also in Asia as far s. as Bengal, and as far e. as Japan. It very often makes its nest in the deserted nest of a crow. It is a bold, active bird, very destructive to poultry and pigeons. The S. has often been trained for purposes of falconry, to take land-rails, partridges, and similar game. The S. of Australia (*A. torquatus*) is marked by a collar of numerous bars of white: its habits are similar to those of the European sparrow-hawk.—The American S. (*Falco sparverius*), common in most parts of the United States, is similar in size to the European S., but is allied rather to the kestrel. It is one

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of our prettiest birds, about the size of a pigeon, the head slaty blue, the back rufous, the tail bright chestnut, the underparts white, and the body and tail more or less spotted or barred according to sex. It is a sanguinary destroyer of small birds. Other Amer. species are described.

SPARRY: see under SPAR 1.

SPARSE, a. *spárs* [L. *sparsus*, scattered—from *spar-gĕrĕ*, to scatter: It. *sperso*: F. *épars*]: thinly scattered; not dense. SPARSE'LY, ad. -*lĭ*. SPARSE'NESS, n. -*nĕs*, state of being sparse; thinness.

SPARSE, v.: OE. for DISPERSE.

SPARTA, *spár'tá* (anciently LACEDÆMON): the most famous city of Peloponnesus, and next to Athens the most powerful and important of the Greek states—for S. was not so much a city as a group of villages occupying partly a range of low hills on the right bank of the Eurotas, and partly the intervening plain. It lay picturesquely between the mountain ranges of Parnon and of Taygetus, which rose to its greatest height of 7,900 ft. in the anc. Taleton (now St. Elias) near the city. At the n. end this valley was closed by the mountains of Arcadia; at the s. end its two mountain walls projected far into the sea. The mountains were clothed with primeval forests, in which the Spartans hunted the stag and the wild-boar. S., even in its palmiest days, had an appearance far below its renown; for, though not destitute of handsome public buildings, the severe law ascribed to Lycurgus, that 'the doors of every (private) house should be fashioned only with the saw, and the ceiling with the ax,' cramped the development of architecture and the fine arts. The natural defenses of the place, or at least, of the long valley of Lacedæmon (now known as Laconia), in which S. stood, were so great that it continued unfortified till the Macedonian period—nearly a century after its mighty struggle with Athens for the hegemony of Greece; indeed, it was not regularly fortified till the time of the tyrant Nabis (B.C. 195). Its mountain barriers gave few practicable passes for an invading army. Previous to the Dorian conquest, the primitive Achæans of S. seem to have dwelt in four or five unconnected hamlets. These hamlets, welded into a sort of city by the conquerors, became known as town-districts. The city, however, never had the compactness of other great Grecian cities; its houses mostly stood in large gardens or open grounds. The Acropolis of S. occupied a hill in the n. part of the city, and was adorned with a temple to Athena (the tutelary goddess of S.), plated with bronze, whence it was called the Brazen House, and the goddess herself *Chalciæcus* (Dweller in the Brazen House). On the bronze plates were beautifully sculptured various Greek myths. At the e. base of the Acropolis stood the Agora, or Market-place, whence streets proceeded to the different quarters of the city: here stood the public buildings of the magistrates. The Agora contained many statues. The principal street in S., called the Aphetaïs, ran s. from the Agora to the s. wall, through the most level part of the

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city, and was lined with a long succession of monumental edifices, chiefly *heroa* and sanctuaries. Along the banks of the Eurotas stretched the *Dromos* (Race-course), in which were several *gymnasia*, with temples of the DioscURI, of the Graces, etc., and numerous statues; and still further s. lay a broader level, Platanistas, so called from the plane-trees that grew there. This was the scene of those mock-contests in which the Spartan youth learned to face without fear the realities of war.

The history of S. is really the history of Laconia, or of the s.e. Peloponnesus. When the four hamlets, the *Pre-Dorian* S., originated, we have no knowledge; but doubtless their inhabitants were Achæans. To the period during the rule of the Achæan princes, the events of the famous but unhistorical expedition against Troy, forming the subject of Homer's *Iliad*, are ascribed. Menelaus, husband of Helen, whose flight with Paris occasioned the Trojan war, was king at S., and it was during the reign of his grandson, Tisamenus (according to the legend), that the Dorians (q.v.—see also DORIS) invaded Peloponnesus. The fact of a Dorian invasion is universally admitted; but of the details, scanty even as they are, we may safely be skeptical. We cannot be certain of the date of the event—not even of its century. All that is clear is, that the native Achæan population were deprived of political privileges; and appear thenceforth as *Periæci* (q.v.) and Helots (q.v.)—the Dorian conquerors alone forming the historical Spartans. Toward the middle of B.C. 8th c., the Dorians of S. had not only thoroughly established themselves in their new settlement, but had subjugated the whole of the fertile and beautiful vale of Lacedæmon, commonly known as Laconia, and had begun to cherish ambitious views of extending their supremacy over the other Dorian settlements in Peloponnesus—viz., Messenia and Argos. Hence originated the Messenian wars (see MESSENIA), which terminated B.C. 668 in the complete overthrow of the Dorians of Messenia, who were reduced by the victorious Spartans to the condition of *Periæci*. Similar struggles occurred both with the older Achæan inhabitants in the centre of Peloponnesus and with the Dorians of Argos, etc., in which the Spartans were generally successful. The development of their warlike and ambitious character is usually ascribed to the institutions of Lycurgus (q.v.); and whatever we may think of that nearly mythical personage, the institutions connected with his name were fitted to make the Spartans exactly what they figure in history—a race of stern, cruel, resolute, rude, and narrow-minded warriors, capable of momentary self-sacrificing patriotism (as in the story of the 300 heroes who fell at Thermopylæ), but without the capacity for adopting or appreciating a permanently noble and wise policy. The outbreak of the Peloponnesian war (B.C. 431) brought the rivalry between S. and Athens to a head; and in the mighty struggle that ensued, victory declared on the side of the combatant least capable of maintaining the greatness of Greece. S. now attained the hegemony of Greece; but her insolent tyranny in her hour

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of triumph excited fierce and lasting indignation; and the valorous retaliations of the Thebans under Epaminondas (q.v.) stripped her of all her splendid acquisitions, and reduced the Laconian state to its primitive boundaries. Later, the rise of the Macedonian power limited still more the Spartan territory, and it never regained its earlier dimensions. Finally, after a series of vicissitudes, S. passed into the hands of the Romans, became a portion of the Roman province of Achaia, and shared the fortunes of the great republic.

SPARTACUS, *spár'ta-kūs*: leader in the great insurrection of Roman slaves in s. Italy B.C. 73; probably in point of genius the first servile captain of whom history preserves a record. He was a native of Thrace, perhaps descendant of the kings of Panticapæum. He served in the Roman army, but having deserted was captured and reduced to slavery. Being destined for the arena, S. was placed in a training-school for gladiators, at Capua. A conspiracy to escape was formed among the gladiators (200 in all, mostly Gauls and Thracians), the heads of which were S., and two Gauls, Crixus and Ænomaus. The conspiracy was discovered; but 70, among whom were the leaders, forced their way through the streets of Capua, with such rude weapons as they could seize, defeated a detachment of Roman soldiers sent to bring them back, and established themselves on Mount Vesuvius, where they received considerable accessions to their number—chiefly runaway slaves. 3,000 Roman troops under C. Claudius Pulcher sought to blockade them and starve them into surrender. S. was now chosen as their leader, with Crixus and Ænomaus for lieutenants. Descending the hill at a place and in a way totally unexpected, he took his assailants in the rear, and inflicted on them a disgraceful defeat. His original design had been limited to securing his freedom and making his way back to his own country, nor during the two years that the insurrection lasted did he ever forget this ultimate aim; but to effect this, he saw the necessity of a serious and extensive warfare; and proclaiming freedom to all slaves, he raised his trivial mutiny to the dignity of a servile war. Circumstances were favorable. A great portion of Italy, especially of central and s. Italy, had been turned into pastureland (see ROME), and instead of villages of sturdy and independent farmers, who owned the land they tilled, gangs of discontented slaves watched the flocks and herds of great nobles who were demoralized by a plethora of ill-gotten riches. To these slaves S. appealed; they rushed to his standard, and victory followed him. The story of his triumphs reads like a romance. No knight of chivalry was ever more uniformly successful, for a time. After defeating Claudius Pulcher, he routed and slew Cossinius, legate of Publius Varinius; then he worsted Varinius himself in several engagements, capturing his lictors and the very horse on which he rode. All the s. part of the peninsula now fell into his hands: the country was devastated, the cities either pillaged or garrisoned. But

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S. knew too well the enormous resources of Rome, and the extraordinary energy which she was capable of developing in peril, to hope for final reduction of her power: consequently he sought to induce his victorious bands to march n. to the Alps, and thence disperse to their own homes. But the slaves were too deeply intoxicated with their success; and S., against his better judgment, had to continue his career of mere fighting, embarrassed by the jealousies apt to spring up among undisciplined hordes. His military career was gallant, brilliant, and skilful. After the defeat and death of his two lieutenants, who had separated from him (B.C. 72), he marched n. through Picenum toward the Po; overthrew first one consular army under Cneius Cornelius Lentulus, then another under Gellius Poplicola; and at the head of 100,000 men meditated a march on Rome. Since the days of Hannibal, the city had seen no such danger. But servile indecision and unwisdom saved the city. S. was forced by his followers to retreat s., and took up his winter-quarters at Thurii, where he held a great fair for the sale of the spoils of Roman cities. B.C. 71 the pretor Marcus Crassus (q.v.) took the field against the terrible liberator, but for a while even he could do nothing. Near Mutina, the proconsul, C. Cassius Longinus, and the propritor, Cn. Manlius, were defeated; in Picenum, Munimius, legate of Crassus, was utterly routed; at last, however, Crassus succeeded in forcing S. into the narrow peninsula of Rhegium, whence he tried to cross into Sicily, with the view of rekindling the servile war that had recently raged in that island. In this attempt he failed, through treachery of those with whom he had opened negotiations. Crassus now built lines of circumvalation to hem him in and force him to surrender; but one stormy winter-night, S. broke out of the toils prepared for him, and resumed the offensive, though he had suffered heavily by loss and desertion, and his forces had been still further diminished by the formation of an independent army of Gallic slaves, which had no sooner got a leader of its own than it was annihilated by the enemy. Near Petelia, he once more defeated his adversaries; but seeing clearly that with such wretched materials as he had he could not hold out much longer, he made a dash at Brundisium, hoping to seize the shipping in the harbors and get safely across the Adriatic to his native shore, but was baffled by the presence of Lucullus (q.v.). Pompey, too, had returned from Spain, and was nearing the scene—ready, as usual, to reap his unearned laurels. There was nothing left for S. but to die as gallantly as he had lived. Drawing up his army in battle-array, and solemnly slaying his war-horse, he began his last fight in a spirit of heroic desperation (B.C. 71); and after performing prodigies of valor, fell unrecognized among the heaps of his slain foes. His death ended the great insurrection, and 6,000 slaves who had escaped death in the battle were crucified along the high-road from Capua to Rome.

SPARTAN—SPASM.

SPARTAN, a. *spâr'tăn*: pertaining to anc. *Sparta*; hardy; brave. SPARTAN DOG, a blood-hound.

SPARTANBURGH, *spâr'tan-berg*: city, cap. of Spartanburgh co., S. C.; on the Richmond and Danville and the Georgia Central railroads; 93 m. n.w. of Columbia. It is in a wheat, corn, stock-raising, dairy, gold, iron, and limestone region; has excellent water-power; operates gold and iron mines and limestone quarries; and has 8 churches, separate high schools for boys and girls, Wofford Col. (Meth. Episc.), 2 national banks (cap. \$200,000), 1 state bank (cap. \$100,000), and 2 daily and 3 weekly periodicals. Manufactures include carriages, wagons, and bricks. Pop. (1890) 5,544; (1900) 11,395.

SPARTEINE, n. *spâr'tě-în*: a vegetable base extracted from the broom (*Spartium scoparium*): in the form of a volatile oily liquid.

SPASM, n. *spăzm* [F. *spasme*, spasm—from L. *spasmus*; Gr. *spasmos*, a cramp, spasm—from *spaein*, to draw]: a sudden contraction of the muscles of the body, of short duration, generally attended with pain. SPASMODIC, a. *spăz-môd'ik* [Gr. *spasmôdēs*, convulsive]: relating to spasms; convulsive; done by fits and starts. SPASMOD'ICALLY, ad. -lî. SPASMODIC SCHOOL, the class of authors whose writings abound in forced conceits.—*Spasm* is of two sorts. In one, there is an unusually prolonged and strong muscular contraction, not rapidly alternating as usual with relaxation, the relaxation taking place only slowly, after some time: this is known as *tonic spasm* [Gr. *tônōs*, a bracing up] or *Cramp* (q.v.). When in a more moderate degree affecting the voluntary muscles generally, it constitutes *Catalepsy* (q.v.), in which, from the muscles remaining contracted, the limbs will retain whatsoever attitude they are placed in, until the S. is over. But the extreme example is *Tetanus* (q.v.), in which the spasms are so violent and so enduring that they may be said to squeeze the patient to death. In the other form of S., the contractions of the affected muscles take place repeatedly, forcibly, and in quick succession; the relaxations being, of course, equally sudden and frequent. This is named *clonic spasm* [Gr. *klônōs*, an agitation], and is popularly known as *convulsions*: chorea (or *St. Vitus's dance*), epilepsy, and convulsive hysteria, afford examples.

The treatment varies according to the cause of the excessive muscular irritability. Firm pressure on muscles affected with S. will promote their relaxation; and by strong steady pressure on the masseter muscles, the lower jaw has been depressed, so as to open the mouth, in cases of lock-jaw. The medicines employed to counteract irregular or inordinate muscular action are termed *antispasmodics*; but S. may depend on so many different causes that successful remedies must vary extremely; though a few appear to exercise control over spasmodic action generally. These, which may be termed *pure* or *true* antispasmodics, are Asafetida, Cotyledon umbilicus (or Common Navelwort), Wood-soot, Galbanum, Musk, Rue, Sagapenum,

SPASTIC--SPATHULATE.

Sumbul (Jatamansi or Musk Root), and Valerian. Among the narcotics often useful in these affections are, especially, Belladonna, Cannabis Indica (or Indian hemp), Opium, and Stramonium. Sulphuric ether in draught or inhaled, and inhaled chloroform, are often of service. In some cases, remedies which directly depress the vital powers, e.g., prolonged use of the warm bath, or even, in rare cases, abstraction of blood, are the most effectual means of subduing spasm.

SPASTIC, a. *spās'tík* [L. *spasticus*; Gr. *spastikos*, afflicted with cramp or spasms—from *spaein*, to draw]: relating to spasms; having the power to draw to or from—applied to muscular contractions in disease. SPAS'TICALLY, ad. -ly. SPASTICITY, n. *spās-tis'i-ti*, tendency to suffer spasms; a state of spasm.

SPAT, v. *spāt*: pt. of SPIT 2, which see.

SPAT, n. *spāt* [Icel. *spyta*; Dan. *spytte*, to spit (see SPIR 2)]: the spawn or young ejected by shell-fish.

SPATE, or SPAIT, n. *spāt* [Gael. *speid*, a mountain torrent in flood, an overflow]: in *Scot.*, a sudden heavy flood, especially in mountain rivulets, caused by heavy rainfalls; a heavy rainfall; a sudden inundation.

SPATHE, n. *spāth*, or SPATHA, n. *spā'thā* [L. *spatha*; Gr. *spathē*, a broad blade]: in *bot.*, a large membranous bract or kind of leaf forming a sheath which incloses one or more flowers, as in the *Narcissus*. Very frequently the flowers within a spathe are arranged on a *spadix*, which is a succulent spike, with numerous flowers, and of which a familiar example is the Indian turnip or Jack-in-the-pulpit (*Arisema triphyllum*), which has a green or purple-variegated spathe forming the canopy of the 'pulpit.' The spadix is a characteristic feature of the Palms, and in them is compound or branching, and in general is provided not only with a common spathe, but also with secondary spathes at its divisions. SPATHED, a. *spāth'd*, having a spathe or calyx like a sheath. SPATHACEOUS, a. *spā-thā'-shūs*, having the appearance and membranous consistence of a spathe. SPATHAL, a. *spā'thāl*, furnished with a spathe. SPATHELLÆ, n. plu. *spā-thēl'lē* [L. dim.]: small spathes surrounding separate parts of the inflorescence. SPATH'OSE, a. -ōs, having a spathe; resembling a spathe.



Spathe--Flower
of Cocoa
Palm.

SPATHIC, a. *spāth'ik* [F. and Ger. *spath*, a leafy stone, spar]: in leaves or plates; applied to minerals having an even, lamellar, or flatly foliated structure. SPATH'OSE, a. -ōs, in *min.*, having the characters of spar; occurring in broad plates or lamellæ; foliated in texture. SPATH'IFORM, a. -i-fawrm [L. *forma*, shape]: resembling spar in form.

SPATHULATE, a. *spāth'ū-lāt*: another spelling of SPATULATE; see under SPATULA.

SPATTER—SPAVIN.

SPATTER, v. *spăt'tér* [Dut. *spatten*, to splash (see **SPIT** 2 and **SPOT**)]: to scatter a liquid substance on; to sprinkle with some dirty matter; hence, to asperse; to defame. **SPAT'TERING**, imp.: **ADJ.** in *OE.*, for **SPUTTERING**. **SPAT'TERED**, pp. *-tér'd*. **SPAT'TERDASHES**, n. plu. *-dăsh'ëz* [Eng. *dash*, to scatter]: coverings for the legs to keep them clean from mud and wet; leggings.

SPATTLE: see **SPATULA**.

SPATULA, n. *spăt ū-lă*, sometimes **SPATTLE**, n. *spăt'tl* [L. *spat'ula* or *spath ula*, a spoon—dim. of *spatha*; Gr. *spathē*, a broad blade: It. *spatola*: F. *spatule*]: a flat sort of knife used by apothecaries for spreading plasters, etc. **SPAT'ULATE**, or **SPATH'ULATE**, a. *-ŭ-lăt*, in *bot.*, shaped like a spatula or a battledore; more or less rounded toward the summit and narrowed toward the base—applied to a leaf like that of the daisy.



Spatulate
Leaf.

SPATULE, n. *spăt'ŭl* [L.—from *spatula*, L. dimin.—from *spatha*, spade]: a spatula; in *ornith.*, a broadening of the vanes at the end of the rectrices in some birds.

SPAULDING, *spaw'l'ding*, **LEVI**, D.D.: 1791, Aug. 22—1873, June 18; b. Jaffrey, N. H.: missionary to Ceylon. Graduated at Dartmouth Coll. 1815, and Andover Theol. Seminary 1818, he was sent by the Amer. Board 1820 to Jaffna, Ceylon, where he labored till his death—more than half a century. Incidentally, he (with Mrs. S.) superintended a female seminary at Oodooville. He was a thorough scholar. Much of his labor was given to preparing books in the Tamil language, of which he had perfect command in speaking as well as writing. Dr. S. preached in houses, or by the roadside, or wherever he could get a hearing. He published a *Tamil Dict.* (1844), and an *English and Tamil Dict.*; a revision of the Bible in Tamil; and, in that language, *Notes on the Bible*; *Scripture Hist.*; a translation of *Pilgrim's Progress*, school-books, tracts, etc. He was also author of many of the most meritorious hymns in the Tamil hymnal used by the missions. Dr. S. gained the love of the natives. His age, 82, at death, exceeded that of any missionary of the Amer. Board, at the time.

SPAVIN, n. *spăv'in* [It. *spavenio*; OF. *esparvain*, a cramp or convulsion of sinews in horses: O. Dut. *spat*, a cramp]: disease of *horses*, a hard tumor or swelling in or near a joint, particularly in the hock, causing lameness. **SPAVINED** a. *-ind*, affected with spavin.—*Spavin* occurs under two different forms, both interfering with soundness. In young, weakly, overworked subjects, the hock-joint is sometimes distended with dark-colored thickened synovia or joint-oil: this is bog or blood spavin. Wet bandages, occasional friction, a laxative diet, and rest, should for several weeks be diligently tried; and if such remedies prove unsuccessful, the swelling must be dressed with strong blistering ointment, or fired. The second variety of S. is more common and serious. Toward the in-

SPAWN—SPEAK.

side of the hock, at the head of the shank-bone, or between some of the small bones of the hock, a bony enlargement may be seen and felt: this is bone-spavin. At first there is tenderness, heat, swelling, and considerable lameness; but as the inflammation in the bone and its investing membrane abates, the lameness is less perceptible, though the animal continues to drag his leg and go stiffly. In recent and slight cases, cold water should be applied continuously; but in serious cases, when the limb is swollen and tender, hot fomentations are best. For several days they must be perseveringly employed. When the limb is again cool and free from pain, an iodide of mercury or fly-blister should be applied, and the animal treated to a long rest.

SPAWN, *n.* *spawn* [Bav. *span*; Dut. *spenne*, milk drawn from the breast]: the eggs of fish or frogs when cast forth; the spores of fungi; any product or offspring, in contempt: *V.* to produce or deposit eggs, as fish; to bring forth or to issue, as offspring, in contempt. **SPAWN'ING**, *imp.* **SPAWNED**, *pp.* *spawn'd*. **SPAWN'ER**, *n.* *-ér*, a female fish.

SPAY, *n.* *spā* [etym. doubt.]: a hart three years old.

SPAY, *v.* *spā* [Gael. *spoth*; Bret. *spaza*, to castrate: *L. spado*; Gr. *spadōn*, a eunuch]: to extirpate the ovaries of; to castrate—said of a female animal. **SPAY'ING**, *imp.* **SPAYED**, *pp.* *spād*.

SPEAK, *v.* *spēk* [AS. *sprecan*, *specan*; Ger. *sprechen*; Fris. *spreka*, to speak: Icel. *spekja*, speech]: to utter articulate sounds, applied to human beings; to make thoughts known by words; to talk; to converse with; to converse, or to be able to converse, in a language; to discourse; to make a speech; to address; to accost; to give sound; in *OE.*, to proclaim; to celebrate; to exhibit; to make known. **SPEAK'ING**, *imp.*: *N.* act of uttering words; discourse. **SPOKE**, *pt.* *spōk*. **SPOKEN**, *pp.* *spō'kn*. **SPEAKER**, *n.* *spēk'-ér*, one who speaks. **THE SPEAKER**, chairman of some legislative bodies—usually national or state bodies (see below). **SPEAK'ERSHIP**, *n.* office of speaker. **SPEAK'-ABLE**, *a.* *-ā-bl*, that can be spoken; in *OE.*, having the power of speech. **SPEAKING-TRUMPET**, *instr.* resembling a trumpet, by which the sound of the human voice can be carried to a great distance. **SPEAKING-TUBE**, tube extending in any direction, through which conversation can be carried on between one apartment and another. **TO SPEAK A SHIP**, to hail or speak to, as the capt. or commander of one ship to another while their ships are passing near each other at sea.—**SYN.** of 'speak': to talk; discourse; articulate; say; tell; converse; pronounce; utter.

SPEAKER, THE: presiding officer of the U. S. house of representatives and analogous legislative bodies in the United States and elsewhere.—In England the presiding officer not only of the house of commons but also of the lords is termed S.—In the U. S. house of representatives the S. is an official of very important and responsible functions: he is a member, elected by majority vote of the members in attendance. He presides over the deliberations, chooses the chairmen and members of the numerous committees of the house, supervises the journal, and signs all bills passed by the house, as well as all warrants, subpoenas, etc., issued by authority of the house. The S. of the U. S. house of representatives has the right, as member, to vote on all questions before the house; but ordinarily he does not exercise this right, except when his vote may be decisive. The rules of the house always provide that 'the S. shall not be required to vote in ordinary legislative proceedings, except where his vote would be decisive, or where the house is engaged in voting by ballot.' And as the S. has the right to vote, so he may take part in the debates; but then he calls a member to the chair while he steps down upon the floor of the house. In the British house of commons the S. may neither vote nor enter into the debate.—In the U. S. house of representatives the chair, in the absence of the S., is occupied by a member named by the speaker to be S., *pro tempore*, or, in default of action by the speaker, then named by the house. The S. is removable from office by vote of the house. In event of the death of the S., the house elects his successor; in case of his disability, the house may choose a S. *pro tempore* or may declare the chair vacant and elect a new speaker.

In the Eng. house of lords the lord chancellor is S. He may speak or vote on any question, and has no more authority than any other member of the house. In the house of commons the S. is a member elected to that office at the desire of the crown, and confirmed by the royal approbation given in the house of lords. A similar office seems to have existed as early as the reign of Henry III., when Peter de Montfort signed and sealed an answer of the parliament to Pope Alexander, *vice totius communitatis*; but the title S. was given first to Sir T. Hungerford in the reign of Edward III. The S. of the house of commons presides over the deliberations of the house, and enforces the rules for preserving order: he puts the question, and declares the determination of the house. As the representative of the house, he communicates its resolutions to others, and conveys its thanks or its censures. He is thus the mouth piece of the house, whence his title S. seems derived. He issues warrants in execution of the orders of the house for commitment of offenders, for issue of writs, attendance of witnesses, bringing up prisoners in custody, etc. The mace is borne before him by the serjeant-at-arms when he enters or leaves the house; when he is in the chair, the mace is left on the table, and it accompanies him on all state occasions. He cannot speak or vote

SPEAKING—SPEAR.

on any question, but on an equality of voices he has a casting-vote. Both by ancient custom and legislative declaration, he is entitled to take precedence of all commoners.

SPEAK'ING: see **READING AND SPEAKING**.

SPEAKING-TRUMPET: instrument for giving concentration rather than dispersion to the waves of sound originated by the articulation of the human voice; thereby enabling the sound to be conveyed to a greater distance. It is of utmost use on shipboard in enabling the officers to convey orders during windy weather from one part of the deck to another, or to the rigging. Though some instrument of the kind appears to have been employed earlier in more than one part of the world, the S.-T. in its present form is a modern invention, whose origination is claimed for Athanasius Kricher (q.v.), and for Sir Samuel Morland, who (1670) submitted to the London Royal Soc. a communication on the best form for such an instrument.

The theory of the action of the S.-T. has never been thoroughly explained; but it is supposed that the sides of the tube throw the sound back and back in various reflections, until ultimately the waves quit the instrument in parallel lines. It does not seem to depend on vibration of the instrument.

SPEAR, n. *spēr* [Dan. *spær*; Dut. and Ger. *speer*, a spear, a lance: L. *sparus*, a hunting-spear]: sharp-pointed weapon, variously shaped, with a long (usually wooden) shaft—for thrusting or for throwing, also for receiving and repelling an assault (see **JAVELIN**: **LANCE**: **PIKE**): V. to pierce or kill with a spear. **SPEAR'ING**, imp. **SPEARED**, pp. *spērd*. **SPEAR-HEAD**, the bone, stone, or metallic point of a spear. **SPEAR'MAN**, n. a man armed with a spear. **SPEAR-GRASS**, any long stiff grass. **SPEAR'MINT**, n. *-m'nt*, plant. species of mint having spear-shaped leaves (see **MINT**). **SPEAR'WORT**, n. *-wōrt*, certain species of *Ranunculus*, *R. lingua* and *R. flammula*.

SPEAR, *spēr*, **SAMUEL P.**: 1815–1875, May 5; b. Boston: soldier. He entered the U. S. army 1833; served in the Seminole Indian war in Fla.; and through the Mexican war, in which he was wounded at Cerro Gordo; took part in several campaigns against hostile Indians on the plains, and in the Utah expedition; entered the Union army as lieut.col. 11th Penn. cav. 1861; was elected col. 1862; distinguished himself on scouting expeditions in the civil war; was severely wounded at Five Forks; was promoted brig.gen. and brevetted maj.gen.; resigned 1865, May 9; and died from the effects of his service.

SPEAR, *spēr*, **SAMUEL THAYER**, D.D., LL.D.: 1812, Mar. 4—1891, Mar. 31; b. Ballston Spa, N. Y.: Presb. clergyman. He graduated at the New York Coll. of Physicians and Surgeons 1833, but abandoned medicine for theology, which he studied with Dr. S. S. Beaman at Troy, N. Y.; was pastor of the 2d Presb. Church, Lansingburg, 1836–43, and afterward of the South Presb. Church, Brooklyn; resigning 1871 to take an editorial position on the New York *Independent*, having charge of constitutional, finan

cial, and, for a time, political subjects; and was a frequent contributor of articles on other topics. He published: *Family Power* (1846); *Religion and State* (1876); *Constitutionality of Legal-Tender Acts* (1877); *The Law of the Federal Judiciary* (1883); *The Law of Extradition* (1884); *The Bible Heaven*; also volumes of sermons and essays. He was regarded as an authority on such legal subjects as those in his published volumes. As preacher and pastor he was highly successful; and as a clear, incisive debater, he had much influence in ecclesiastical assemblies.

SPEAR'-FOOT, of a Horse: the right hind-foot.

SPEC, n. *spěk*: in *slang*, for SPECULATION.

SPECIAL, a. *spěsh'ăl* [F. *spécial*—from L. *speciālis*, belonging to a particular sort or kind, not general—from *speciēs*, a particular sort: It. *speciale*]: pertaining to a species or sort; particular; designed for a particular purpose; confined to some particular department or subject; extraordinary; uncommon; in *OE.*, chief in excellence. SPE'CIALIZE, v. -īz, to particularize; to determine in a special manner. SPE'CIALIZING, imp. SPE'CIALIZED, pp. -īzd. SPE'CIALIZA'TION, n. -ī-zā'shūn, the act of making special; special determination. SPE'CIALLY, ad. -lī, in a special manner, particularly above others. SPE'CIALITY, n. -ī āl'ī-tī [F. *spécialité*—from L.]: the special or particular mark of a person or thing; an object of special attention. SPE'CIALTY, n. -āl-tī, a particular case; an obligation or bond; that for which a person is distinguished. SPECIAL CASE, or CASE STATED, in *law*, statement, in compendious form, of the facts on which any question of law or equity arises, which is drawn up by mutual agreement of the parties at any stage of the suit or even at the beginning, and submitted to the court for its decision as to the proper application of the law or the proper legal inference from the facts. SPECIAL CONSTABLE, one appointed for a particular occasion. SPECIAL JURY (see below). SPECIAL LICENSE, in the Eng. marriage law, a license given by the Abp. of Canterbury authorizing a priest to solemnize a marriage without publication of bans, and at a time and church other than those required in ordinary cases: it is a continuance to the abp., from the time of Henry VIII., of the right in such cases held previously by the pope. SPECIAL PLEADER, in *law*, one who draws common-law pleadings: see under PLEA. SPECIAL PLEADINGS, in *law*, special or new matter; the whole science of pleading: in general, the specious but unsound arguments of one whose object is victory and not truth. SPECIAL VERDICT, in *law*, a finding of the naked facts of the case by a jury, leaving to the court the application of the law to them.—SYN. of 'special': appropriate; peculiar; specific; particular; distinctive.

SPECIAL JURY—SPECIE PAYMENT.

SPECIAL JURY: jury selected with the assistance of the parties to a suit at law: for a S. J. in the United States, see **JURY**.—In Eng. law, a S. J. consists of a superior class of men, e.g., esquires, or men of higher degree, bankers, merchants, etc., selected by the sheriff and formed into a separate list. The advantage of a S. J. is that the jurors are less liable to be carried away with prejudices, and more intelligent, and able to understand difficult cases.

SPECIALTY DEBT: debt constituted by deed under seal, as a bond, which in the event of the debtor's death formerly had, in English law, a right of prior payment over Simple Contract (q.v.) debts. This preference was abolished 1870, except when a lien or other security is held for the debt. In the United States, a specialty may be definitive evidence of a debt, but it does not *per se* give the debt any priority.

SPECIE, n. *spē'shĭ* or *spē'sh'ū* [from *spec.ē*, which see, as if paid *in specie* = paid in visible coin]: gold and silver coin, as distinguished from paper money or bank-notes.

SPECIE PAYMENT, RESUMPTION OF: by the treasury of the United States, 1879, Jan. 1. The New York banks having suspended specie payments 1861, Dec. 30, the U. S. treasury immediately found itself compelled to do likewise: thus began the period of suspension of specie payments in the United States, which continued 18 years. The first practical step toward resumption was taken 1865, when congress authorized the sec. of the treasury to withdraw monthly \$4,000,000 of treasury notes; but this process ceased within two years. Not till 1875 was the law enacted which formally authorized resumption of specie payments, and that law deferred the time of resuming to 1879. The mode of providing for resumption was to withdraw \$80 of the U. S. legal-tender notes for every \$100 of national bank-notes issued, until the sum of the outstanding legal-tenders should be reduced to \$300,000,000; and to accumulate the gold coming from customs duties and sale of bonds. In this way a sufficient amount of coin was accumulated to meet any demand when the day set for resumption (1879, Jan. 1) arrived; and the change was made without the least injury to any of the financial and commercial interests of the country, although it had in advance been stigmatized as either impracticable or ruinous by some financial authorities. The year of resumption was marked by almost unexampled commercial prosperity in the United States: the imports were \$270,000,000 less than the exports; the crops, too, were unusually bountiful. As a consequence, the prices of merchandise and securities of all kinds advanced rapidly, and a state of buoyancy, activity, and speculation ensued.—See **DEBT, NATIONAL: CURRENCY**.

SPECIES, n. *spē'shēz* [L. *speciēs*, a particular sort—from *speciō*, I look at, I behold: It. *specie*, sort, appearance]: a sort; a kind; a race; group of individuals or objects sufficiently identical in all their natural qualities to justify the conclusion that they may have sprung from a common stock; a collection of like individuals produced by other individuals equally like them; a rank subordinate to a *genus* (see below): group of individuals agreeing in common attributes, and designated by a common name; in *med.*, the component part of a compound medicine.

SPE' CIES, in Natural History: term designating groups inferior to genera (see GENUS), but superior to varieties (see VARIETY). In mineralogy, the term is of different application, serving the purpose of classification; distinguishing only analagous composition and a like system of crystallization, it admits of one element replacing another, and includes minerals of very different appearance and physical properties. In organic nature, it has usually been regarded as possessing a higher and more definite signification. But no term is more difficult to define. Many definitions have been proposed, but none wholly satisfactory; every attempt at definition involving more or less the adoption of some disputed theory. If, e.g., a S. is regarded as including all the beings which have descended from parents created with the essential characters now belonging to the S., not only is the original creation in that particular form taken for granted, but likewise the impossibility of changes in nature, which some most eminent naturalists regard as actually taking place, and the belief of which implies no doubt of the act of creation itself, but only a certain opinion as to some of the laws by which organic nature is governed. To regard S. as mere indeterminate and fluctuating groups, capable of indefinite modification in the lapse of ages, is equally to adopt a theory. If a S. is defined as containing all the individuals capable of intermingling without consequent sterility of progeny, other difficult questions must be decided before the definition can be adopted as to any classes of creatures; while to many kinds it seems incapable of application, and much that is merely theoretical is involved in it.

Naturalists have very generally regarded S. as unchanging throughout an indefinite succession of generations, except within narrow and marked limits; and have adopted substantially the definition of Buffon: 'A *species* is a constant succession of individuals similar to and capable of reproducing each other.' Thus De Candolle, eminent botanist, says: 'We unite under the designation of a *species* all those individuals that mutually bear to each other so close a resemblance as to allow our supposing that they may have proceeded originally from a single being or a single pair.' And Cuvier, great zoologist, describes a S. as 'a succession of individuals which reproduces and perpetuates itself.'

SPECIES.

Here it is to be remarked, that even if the permanence of S. implied in these definitions were ascertained, and their original creation in their present form admitted as unquestionable, it would by no means follow that we must suppose every S. to have proceeded from a single individual or a single pair. Nor, accepting the biblical statement concerning the human race, that all mankind are the offspring of a single pair, are we entitled to infer that the same has been the case also as to all animals and plants capable of freely intermingling, and which, therefore, are commonly regarded as forming one species.

But the separate creation and immutability of S. are disputed, the large majority of naturalists maintaining that S. undergo modification, and that existing forms of life have descended by true generation from pre-existing forms. Lamarck was the first to proclaim this doctrine, at least so as to attract much attention, about the beginning of the 19th c. He held that all S., even including man, are descended from S. of inferior organization; while to account for the existence of very simple forms at the present day, he had recourse to the supposition of their spontaneous generation. He was followed, with greater caution, by Geoffroy Saint-Hilaire, who regarded what we call S. as various degenerations of the same type, but did not believe that the existing S. are now in process of modification. Similar views have since been stated by many authors; but the works which have most strongly directed attention to them, and in which they have been most fully advocated, are *Vestiges of the Natural History of Creation* (first published anonymously 1844, but acknowledged in the 12th ed., 1884, to be by Dr. Robert Chambers, q.v.); and, above all, Darwin's work *On the Origin of Species by Means of Natural Selection* (1859).

It is impossible for us to do more than briefly exhibit the principal arguments on this question. Lamarck rested much on the well-known effect of use or exercise in strengthening and enlarging an organ, and of disuse in atrophying it. 'He conceived that, an animal being brought into new circumstances, and called upon to accommodate itself to these, the exertions which it consequently made to that effect caused the rise of new parts; on the contrary, when new circumstances left certain existing parts unused, these parts gradually ceased to exist. Something analogous was, he thought, produced in vegetables, by changes in their nutrition, in their absorption and transpiration, and in the quantity of caloric, light, air, and moisture which they received. This principle, with time, he deemed sufficient for the advance from the monad to the mammal.' The author of the *Vestiges*, from whom this account of Lamarck's views is taken, regards him as in error 'in giving this adaptive principle too much to do;' and says: 'In the present day, we have superior light from geology and physiology, and hence comes the suggestion of a process

analogous to ordinary gestation for advancing organic life through its grades, in the course of a long but definite space of time, with only a recourse to external conditions as a means of producing the exterior characters.' The author of the *Vestiges* designates the principle for which he contends as that of *Progressive Development*, and states it as follows: 'The proposition determined on, after much consideration, is, that the several series of animated beings, from the simplest and oldest up to the highest and most recent, are, under the providence of God, the results, *first*, of an impulse which has been imparted to the forms of life, advancing them in definite times, by generation, through grades of organization terminating in the highest dicotyledons and vertebrata, these grades being few in number, and generally marked by intervals of organic character which we find to be a practical difficulty in ascertaining affinities; *second*, of another impulse connected with the vital forces tending, in the course of generations, to modify organic structures in accordance with external circumstances, as food, the nature of the habitat, and the meteoric agencies, these being the "adaptations" of the natural theologian.' He further regards the *nucleated vesicle* as 'the fundamental form of all organization, the meeting-point between the inorganic and the organic,' and as 'the starting-point of the fetal progress of every higher individual in creation, both animal and vegetable.' Founding on instances of the production of the *proximate principles* of which organic substances are composed in the laboratory of the chemist, he goes on to say that 'an operation which would produce in these the nucleated vesicle is all that is wanting effectually to bridge over the space between the inorganic and the organic;' and that 'it does not seem, after all, a very immoderate hypothesis, that a *chemico-electric operation, by which germinal vesicles were produced*, was the first phenomenon in organic creation, and that the second was *an advance of these through a succession of higher grades, and a variety of modifications*, in accordance with laws of the same absolute nature as those by which the Almighty rules the physical department of nature.' He regards the idea of S. or specific distinction, therefore, 'as *merely applicable to certain appearances presented, perhaps transiently, to our notice*.' He adduces instances of great changes of form and character known to take place in the lower departments of nature, both animal and vegetable, as giving probability to the supposition that in a long succession of generations great changes may take place also in the higher.

The whole theory of the author of the *Vestiges* as to organic nature has been exposed to objection in consequence of its connection with views of the general system of the universe altogether foreign to the present subject; and because of an evident inclination to the belief in a transition from inorganic to organic existence by chemico-electric operation. The argument is weak-

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ened also by the too ready acceptance of unsubstantial facts, as of the transmutation of one kind of grain into another; and by resting too much on what may be reckoned the mere mistakes of naturalists, as to the forms of the lower kinds of plants and animals, of which genera and even tribes have been constituted, that have afterward been found mere modifications or larval stages of creatures very different in their most apparent characters. Some chief arguments of the *Vestiges* are, however, used by Darwin, though with great scientific caution.

Darwin's views are distinguished from those of all his predecessors by the introduction of what he designates the principle of *Natural Selection* (see DARWINIAN THEORY). It is to be noted, however, that the theory of Natural Selection was arrived at independently by Alfred Russel WALLACE (q.v.). Darwin maintains the variability of S.; and adduces much evidence to show that variation is continually taking place, in consequence of the external conditions to which plants and animals are subjected. He rests much on the difficulty of distinguishing between varieties and S., and on the changes known to result from cultivation and domestication. He dwells on the *selection* which man makes, in order to produce new breeds or varieties, and supposes a similar 'selection' to take place in nature, in the *struggle for life*, which all plants and animals must undergo. This *struggle for life* is, in fact, the foundation of his theory. He shows that every kind of plant or animal must struggle, and in order to its continued existence must be successful in its struggle, not only against those other creatures which seek to make it their food, but still more in competition with those which seek the same nutriment with itself. In this struggle, the stronger, or those which possess anything peculiarly favorable in their organization, must overcome the weaker, and the weaker must therefore cease to exist. Thus a slight variation, such as often takes place may be perpetuated; and the possessors of any advantage in the means of procuring food, or in the powers of offense or defense, may entirely displace their less favored congeners. The modifications thus taking place Darwin regards as accounting for the changes in organized beings from one geologic period to another, and for the great differences in the plants and animals of different parts of the world. In support of his views, he argues from the tendency to variation seen in cultivated plants and domestic animals, and the perpetuation of the forms so produced in breeds and races; and from the fact that the variations in cultivated and domestic S. are in some cases greater than those which are regarded as affording grounds of specific, sometimes even of generic or greater distinctions in a state of nature. 'Can it be thought improbable,' he says, 'seeing that variations useful to man have undoubtedly occurred, that other variations useful in some way to each being

in the great and complex battle of life, should sometimes occur in the course of thousands of generations? If such do occur, can we doubt—remembering that many more individuals are born than can possibly survive—that individuals having any advantage, however slight, over others, would have the best chance of surviving and of procreating their kind? On the other hand, we may feel sure that any variation in the least degree injurious would be rigidly destroyed. This preservation of favorable variations, and the rejection of unfavorable variations, I call *Natural Selection*. Variations neither useful nor injurious would not be affected by natural selection, and would be left a fluctuating element, as perhaps we see in the S. called polymorphic.' He further supports these views by pointing out the favorable opportunity for the operation of natural selection afforded in a country undergoing great physical changes, as of climate; and particularly in an island, or a country surrounded by barriers sufficient to prevent the ready immigration of S. 'In such cases,' he says, 'every slight modification, which in the course of ages chanced to arise, and which in any way favored the individuals of any of the S. by better adapting them to their altered conditions, would tend to be preserved; and natural selection would thus have free scope for the work of improvement.'

Darwin supposes new variations to be continually taking place, but the greater number of these speedily to become extinct; while others, becoming perpetuated, and perhaps causing the extinction of the original forms, give rise to other forms, until some of them have so widely diverged that all traces of their common origin are lost. He does not, however, commit himself to the opinion that all forms of organic life, or even all plants, or all animals, have a common origin. He completely rejects Lamarck's notion that new and simple forms are continually being produced by spontaneous generation. 'I need hardly say,' he remarks, 'that science in her present state does not countenance the belief that living creatures are now ever produced from inorganic matter,' and he accounts for the existence of low forms of life by saying that 'natural selection includes no necessary and universal law of advancement or development; it only takes advantage of such variations as arise and are beneficial to each creature under its complex relations of life.' So that even the lowest forms might 'be left by natural selection unimproved, or but little improved,' as geology tells us of infusoria and rhizopods, which have remained for an enormous period in nearly their present state.

That S. differ not only in single characters, but in many, Darwin accounts for by reference to unknown laws of the correlation of organs—laws, however, which, though unknown, we know to exist, so that a modification of one organ is attended with modification of other organs, as is exemplified in our domestic breeds; thus,

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hoofs, hair, and teeth show associated variations. It is known, e.g., that an abnormal development of *hair* (as in the Russian peasant, known as the dog-man, *homme-chien*) is often accompanied by arrest of development of the teeth.

In further support of the theory of natural selection, the fact is insisted on, 'that it is the common, the widely diffused, and widely ranging S. belonging to the larger genera within each class, which vary most.' That the several subordinate groups in any class of creatures 'cannot be ranked in a single file, but seem rather to be clustered round points, and these round other points, and so on in almost endless cycles,' Darwin thinks incapable of explanation, except on the supposition of community of origin and natural selection. He points also to the analogous manner in which S. of the same genus vary, as corroborative of his views. He accounts for the absence or rarity of transitional varieties by supposing the predominant forms to have taken possession of their districts, while these were in process of being stocked; and that since these districts differ much in their natural characters, the forms originating in the comparatively unextensive intermediate tracts have not been able to contend against them, and have become extinct. He points out the possibility that areas now continuous may not have been so during a long period, and that species may have been formed while they were in the condition of islands. But this remains one of the difficulties.

He ascribes to natural selection the results which Lamarck ascribed to use and disuse, in the development and atrophy of organs; and thinks it possible that the flying squirrels may thus have had a common origin with the true squirrels, and the *Galeopithecus* with the lemurs; though he admits that we have no graduated links of structure connecting them. 'Nor can I see any insuperable difficulty,' he says, 'in further believing that the membrane-connected fingers and forearm of the *Galeopithecus* might be greatly lengthened by natural selection; and this, as far as the organs of flight are concerned, would convert it into a bat.' Like Lamarck and the author of the *Vestiges*, Darwin rests not a little on the unity of type throughout whole classes of creatures, and the homologies of parts very different from each other, as in the four-limbed structure of the vertebrata generally, and even the articulations of the limbs. He endeavors to trace the eye from its simplest to its most perfect form, and shows how gradual are the transitions found on comparison of existing creatures, from the one to the other. He goes even further, and says: 'Several facts make me suspect that nerves sensitive to touch may be rendered sensitive to light, and likewise to those coarser vibrations of the air which produce sound.'

He dwells at great length on the subject of hybridism, and the general sterility of hybrids, endeavoring to show

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that it presents no insuperable objection to the theory of a gradual modification of S., their sterility being incidental on other differences, and sterility occurring, as he labors to prove, when varieties are crossed, as well as in the hybrids of distinct S. The difficulties presented by geology he obviates very much by insisting on the imperfection of the geological record. He does not adopt the view of the author of the *Vestiges*, that the geological record exhibits to us a succession of animals corresponding in their progressive development with the fetal development of the mammalian embryo. But he founds an argument on the many connecting links in the general system of nature which fossils supply when compared with existing S. And he endeavors to show that his theory is perfectly consistent with the known facts of the geographical distribution of S.; in particular with the remarkable facts of the peculiarity of the fauna and flora of some lonely oceanic islands, and of the frequent occurrence of the same S., both in cold regions comparatively near the pole, and on mountains far remote from each other in lower latitudes—referring the latter class of facts to former geologic periods, when the continental areas were not the same as now, or when the prevailing climatic conditions were very different. And he finds support for his views in the correspondence, without identity, of the floras and faunas of the n. parts of America and of the old world.

It is but a very imperfect sketch which we have thus been able to give of Darwin's theory, and of the arguments by which it is supported. Whatever may be thought of the truth of the theory, it must be admitted to be admirably framed and guarded, and to be maintained not only with great ingenuity of argument, but by the aid of a vast store of scientific information, most skilfully used. Its opponents condemn it as resting on unwarrantable assumptions, and demand some proof, e.g., of the transition of organs from a simple or rudimentary to a complex and approximately perfect state. They also refuse to acknowledge such imperfection of the geological record as Darwin's argument demands, and they insist much on the completeness of the changes which that record discloses, and the absence of transitional forms both among fossils and existing species. This objection may probably be deemed weak and inapt; inasmuch as even if the absence of transitional forms, or 'links,' were a fact pertaining to the present stage of discovery, it would be mere conjecture to assume it as a fact pertaining also to further scientific exploration. This whole class of objections to the Darwinian theory follows that theory itself into the wide field of conjecture—adopting the method of assuming that because a certain thing 'may' have occurred, and cannot now be shown not to have occurred, and can be shown to be even probable in some points of view, therefore that very thing occurred; such occurrence being then taken as the basis of a wide-reaching theory of the

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universe. In any event, this objection of the absence of transitional forms has met what is claimed by evolutionists as a triumphant refutation by the discovery of a long series of fossil 'horses' ranging through about 45 'species' from a 5-toed ancestral form to the one-toed form of to-day: see HORSE, FOSSIL. 'The successive forms of the equine type,' writes Prof. Huxley, 'have been fully worked out; while those of nearly all the other existing types of ungulate mammals and of the *Carnivora* have been nearly as closely followed through the Tertiary deposits; the gradations between birds and reptiles have been traced, and the modifications undergone by the *Crocodylia*, from the Triassic epoch to the present day, have been demonstrated' (see SAUROPSIDA).

Much of what Darwin and ther advocates of the same general views contend for, his opponents admit; a certain power of development in organic nature, a 'struggle for life,' and a degree of 'natural selection;' but they regard the limits of development and variation as comparatively narrow. Nor would the state of the question, as they believe, be materially affected, if many of what have hitherto generally been regarded as species, should be proved to be mere varieties. Any number of such errors of naturalists might be exposed and corrected, without modification of our views of the laws of nature; and errors of this kind are precisely such as might be expected, when the forms of organic life began to be discovered and described, and ere yet there was time for their mature study in all parts of the world, and under all various circumstances.

The hypothesis of Darwin is spoken of often as the *evolution theory*. But it must be remembered that it is not the only theory of evolution; Darwin's fundamental idea being that of evolution by *natural selection*—'survival of the fittest,' as Herbert Spencer expresses it. Evolutionism has made remarkable progress during recent years. Scarcely a living naturalist now entirely rejects it, and the vast majority indeed are earnestly occupied in its elucidation and application. The theory too is being extensively applied in sociology and philosophy.—See DARWIN; DARWINIAN THEORY; ZOOLOGY; MAMMALIA; DESCENT OF MAN; DEVELOPMENT OF THE EMBRYO; EVOLVE (EVOLUTION): also ANTHROPOLOGY; COSMOGONY.—See also Darwin's *Origin of Species*, *Descent of Man*, and other works; Lyell's *Principles of Geology*; Huxley's *American Addresses* and *Science and Culture*; Haeckel's *Natural History of Creation*, etc.

SPECIFIC GRAVITY.

SPECIFIC GRAVITY: the proportion which the weight of a certain bulk of a given body bears to the same bulk of another body taken as a standard. The standard for substances solid and liquid is distilled water at the temperature of 62° F., barometer 30 inches; and the weight of a cubic inch of this standard is 252·45 grains; hence a cubic ft. of it weighs 997·129 oz., or 62·32 lbs. It is convenient to remember that a cubic ft. of water weighs about 1,000 oz. avoirdupois, as the error resulting from employing this estimate amounts to little more than $\frac{1}{316}$ of the whole. For aeriform bodies, the standard is atmospheric air, 100 cubic in. of which, at a temperature of 60° F. and 30 in. barometer, weighs 30·935 grains; and a cubic ft. of air weighs 536·96 grains, which is $\frac{1}{18}$ of the weight of the cubic ft. of water at the same temperature. The S. G. of solid bodies is measured best by the hydrostatic balance (see ARCHIMEDES, PRINCIPLE OF), which gives the weight of a volume of water equal in bulk to the solid, by which it is only necessary to divide the weight of the solid in air to obtain the S. G.; that of liquids may be obtained by the Areometer (q.v.), or by comparing the weight lost by a solid body in the liquid and in water, and dividing the former by the latter—or by means of the *specific-gravity bottle*, which holds exactly 1,000 grains of distilled water in its standard condition. The bottle is emptied of water, filled with the liquid, and then weighed; the result gives the weight of a volume of the fluid equal in bulk to 1,000 grains of the standard, and hence this weight divided by 1,000 gives the S. G. The S. G. of an aeriform fluid is determined by weighing a glass globe filled first with the fluid and then with atmospheric air. Annexed is a table of the S. G. of a few of the more common substances.

SOLIDS (METALS),

| | Sp. Gr. | | Sp. Gr. |
|-------------------------|---------|-----------------|-----------|
| Iridium (hammered)..... | 21·15 | Iron..... | 7·80 |
| Platinum | 21·50 | Tin..... | 7·30 |
| Gold .. | 19·50 | Zinc | 6·80—7·80 |
| Mercury | 13·59 | Antimony..... | 6·80 |
| Lead..... | 11·45 | Arsenic | 5·70—5·90 |
| Silver | 10·50 | Aluminium | 2·67 |
| Bismuth..... | 9·82 | Calcium..... | 1·58 |
| Cobalt..... | 8·50 | Sodium | ·97 |
| Copper. . . | 8·95 | Potassium..... | ·86 |
| Manganese | 7·13 | | |

OTHER SOLIDS.

| | Sp. Gr. | | Sp. Gr. |
|-------------------|---------|------------------------|---------|
| Loadstone..... | 4·93 | Honey | 1·45 |
| Ruby | 4·28 | Lignum-vitæ..... | 1·33 |
| Topaz..... | 4·03 | Coal | 1·16 |
| Diamond..... | 3·52 | Amber..... | 1·08 |
| Limestone | 2·70 | Spanish Mahogany..... | 1·06 |
| Chalk..... | 2·45 | English Oak..... | ·97 |
| Glass, Flint..... | 2·90 | Butter..... | ·94 |
| Granite..... | 2·78 | Ice..... | ·93 |
| Flint..... | 2·58 | Human Body, alive..... | ·89 |
| Clay | 2·16 | Ash..... | ·84 |
| Ivory | 1·92 | Elm..... | ·67 |
| Bone..... | 1·66 | Poplar..... | ·38 |
| Sand..... | 1·50 | Cork..... | ·24 |

SPECIFIC—SPECIMEN.

LIQUIDS.

| | Sp. Gr. | | Sp. Gr. |
|----------------------|---------|------------------------|---------|
| Sulphuric Acid..... | 1.84 | Champagne Wine..... | 1.00 |
| Nitric Acid..... | 1.50 | Burgundy Wine..... | .99 |
| Aqua Regia..... | 1.23 | Whisky, average | .92 |
| Blood..... | 1.04 | Oil of Turpentine..... | .87 |
| Oil of Cinnamon..... | 1.04 | Brandy | .84 |
| Oil of Cloves..... | 1.03 | Alcohol, pure..... | .80 |
| Milk | 1.03 | Ether, Sulphuric..... | .72 |
| Tar | 1.01 | | |

GASES.

| | Sp. Gr. | | Sp. Gr. |
|----------------------|---------|-------------------|---------|
| Hydriodic Acid..... | 4.37 | Oxygen..... | 1.10 |
| Chlorine | 2.45 | Olefiant Gas..... | .98 |
| Sulphurous Acid..... | 2.21 | Nitrogen..... | .97 |
| Cyanogen..... | 1.80 | Prussic Acid..... | .94 |
| Carbonic Acid..... | 1.52 | Ammonia..... | .59 |
| Muriatic Acid..... | 1.28 | Hydrogen..... | .07 |

SPECIFIC, SPECIFICATION: see under **SPECIFY**.

SPECIFY, v. *spěs'î-fî* [F. *spécifier*—from mid. L. *specif-icārē*, to describe, to portray—from L. *speciēs*, a particular sort; *faciō*, I make: It. *specificare*, to specify]: to mention or name in words; to designate so as to distinguish from every other; to determine by a particular mark or limit. **SPECIFYING**, imp. **SPECIFIED**, pp. *-fîd*. **SPECIFIC**, a. *spě-sîf'îk*, or **SPECIFICAL**, a. *-î-kāl*, that designates the species, or constitutes it; definite or particular; effectual, as a remedy. **SPECIFIC**, n. a remedy which acts effectually in particular diseases; that which is peculiar to a thing. **SPECIFICALLY**, ad. *-lî*. **SPECIFICATION**, n. *spěs'î-fî-kā'shûn* [F.—L.]: act of specifying; a designation or statement of particulars; particular mention; a written enumeration of the particulars of a contract, etc. **SPECIFIC CENTRE**, in *nat. hist.*, a term used to express that single point upon which each species had its origin, and from which its individuals became diffused (see **SPECIES**: ETC.). **SPECIFIC CHARACTER**, circumstances distinguishing one species from every other species of the same genus (see **SPECIES**: ETC.). **SPECIFIC GRAVITY**, ratio which the weight of any substance bears to the weight of an equal bulk of pure water—in the case of *gases* the standard is not water, but hydrogen (see below). **SPECIFIC HEAT**, ratio which the amount of heat required to raise a definite mass of a substance to any temperature bears to the amount required to raise an equal mass of water to the same temperature (see **HEAT**). **SPECIFIC LEGACY** (see **LEGACY**). **SPECIFIC NAME**, the name which, appended to the name of the genus, constitutes the distinctive name of the Species (q.v.). **SPECIFIC PERFORMANCE**, actual performance of a contract according to the letter—enforced by a court of equity in cases when the remedy at law—viz. recovery of damages—is manifestly inadequate.

SPECIMEN, n. *spěs'î-měň* [L. *specimen*, an example—from *speciō*, I look at]: a part exhibited in order that the nature and quality of the body or substance may be known; a sample; an instance.—**SYN.**: example; pattern; model; sample; instance; exemplification; copy; illustration; case.

SPECIOUS—SPECTATOR.

SPECIOUS, a. *spě'shūs* [L. *speciōsus*, full of beauty, handsome—from *speciēs*, show, appearance—from *speciō*, I look at: It. *specioso*: F. *spécieux*]: showy; plausible; apparently right; appearing well at first view. **SPECIOUSLY**, ad. -*lě*. **SPECIOUSNESS**, n. -*něs*, the quality of being specious; plausible appearance; fair external show.—**SYN.** of 'specious': ostensible; colorable; plausible; feasible; showy.

SPECK, n. *spěk* [Lith. *spakas*, a speck: Swiss, *speckig*, dirty; O. Dut. *spickelen*, to speckle: Ger. *spucken*; O. Dut. *spicken*, to spit]: a stain; a spot; a blemish; a flaw; anything very small: V. to stain in spots or drops; to mottle. **SPECK'ING**, imp. **SPECKED**, pp. *spěkt*. **SPECKLE**, n. *spěk'kl* [dim. of *speck*]: a small speck; a spot or stain of a color different from that of the object: V. to mark with small spots of a different color. **SPEC'KLING**, imp. -*klěng*. **SPEC'KLED**, pp. -*kld*: **ADJ.** marked with speckles; variegated with spots of a color different from that of the object. **SPEC'KLEDNESS**, n. -*kld-něs*, the state of being speckled.

SPECTACLE, n. *spěk'tă-kl* [F. *spectacle*—from L. *spectac'ulum*, a spectacle—from *specto*, I look at, I behold; *specĕrĕ*, to see]: something exhibited to view, as a thing unusual; anything perceived by the sight; a sight; a pageant; a gazing-stock. **SPECTACLES**, n. plu. -*tă-klz*, glasses mounted on a light frame to assist or correct vision (see below). **SPEC'TACLED**, a. -*tă-kld*, furnished with spectacles. **SPECTACULAR**, a. *spěk-tăk'ŭ-lěr*, of or relating to shows. **SPECTAC'ULARLY**, ad. -*lě*.—**SYN.** of 'spectacle': show; pageant; sight; exhibition; representation.

SPECTACLES: lenses, usually of glass, framed for convenient application to the eyes to aid or to correct vision; an invention of the 13th c., attributed by some to Alexander di Spina, a Florentine monk; by others to Roger Bacon. At first, both the lenses and the frames were exceedingly clumsy: about the beginning of the 19th c., light metal frames were introduced, instead of the cumbrous horn or tortoise-shell mountings still occasionally seen, and known as goggles. S. of exquisite workmanship are now produced, which, with their lenses complete, are a quarter of an ounce in weight. Steel frames have displaced gold, silver, and all other materials, when comfort and effectiveness are preferred. The lenses should be of the best optical glass, which, as a rule, is superior to Brazilian pebble or rock-crystal.—See **SIGHT**, **DEFECTS OF**.

SPECTATOR, n. *spěk-tă'těr* [L. *spectātor*, a beholder—from *specto*, I look at; *speciō*, I behold: F. *spectateur*]: a looker on; an observer; a witness. **SPECTA'TRESS**, n. fem. -*trēs*, a woman who looks on or at. **SPECTA'TORSHIP**, n. in *OE.*, the act of beholding; the office or quality of a spectator.

SPECTRE—SPECTROPHONE.

SPECTRE, n. *spěk'tér* [F. *spectre*—from L. *spectrum*, an appearance, an apparition—from *speciō*, I look at]: the imaginary appearance of a person who is dead; a ghost; an apparition; in *zool.*, a species of lemur, so named from its nocturnal habits and attenuated skeleton like body. **SPECTRAL**, a. *-trāl*, pertaining to a spectre; ghostly. **SPECTROLOGY**, n. *-trōl'ō-jī* [Gr. *logos*, a discourse]: science of chemical analysis by means of the spectra of different elements (see below—**SPECTROSCOPE**: **SPECTRUM**). **SPECTROSCOPE**, n. *spěk'trō-skōp* [Gr. *skopēō*, I view]: one of the most important instrs. of modern scientific research, in which the analysis of light coming from various bodies as light sources is conducted by means of prisms, the object being to determine, from the position of the spectral lines, the composition of the bodies (see below). **SPECTROSCOPY**, n. *-trōs'-kō-pī* [Gr. *skopēō*, I view]: science of determining by analysis of light through the spectroscope the constituent elements of the body whence the light comes. **SPECTRUM**, n. *-trūm*, plu. **SPECTRA**, *-trā* [L. *spectrum*, appearance, image]: the image of something seen after the eyes have been closed; the figure of the prismatic colors formed in a darkened chamber by permitting a ray of sunlight to pass into it through a prism—a *spectrum* may be formed by a ray from any luminous body, as from a star, a planet, etc., or from any body in a state of incandescence (see **SPECTRUM**, below). **SOLAR SPECTRUM**, spectrum formed by solar light, especially as thrown by a prism on a screen in a darkened room. **SPECTRUM ANALYSIS** (less properly, **SPECTRAL ANALYSIS**), act or art of ascertaining the character and composition of luminous bodies, by causing a ray of light from the body to pass through a prism, each substance in the spectrum having its own characteristic system of lines (see below—**SPECTROSCOPE**: **SPECTRUM**).

SPECTRE BAT (*Phyllostoma*): genus of bats having two membranous crests on the nose, one leaf-like, the other in the form of a horseshoe—giving their face that peculiar appearance from which they derive their name. The species are numerous, natives of the W. Indies and S. America.

SPECTROPHONE, *spěk'trō-fōn* [L. *spectrum*; Gr. *phonē*, sound]: instrument for studying spectra (see **SPECTRUM**) by means of audible vibrations produced in a telephone receiver. Its essential parts are a Spectroscope (q.v.) minus the eye-piece, an opaque diaphragm containing a slit, and a hearing-tube, connected with the body, made to vibrate by the spectrum. Having discovered the principle of the Photophone (q.v.) and found that intermittent or variable rays of light cause vibrations in all bodies, Alexander Graham Bell, in further researches, repeated an experiment by Mercadier on the audible effects of the different parts of a spectrum. Mercadier had transmitted through a prism an intermittent beam from an electric lamp, and noted a difference in the audible effects in the several parts of the resulting spectrum. In Bell's experiment, 'sounds were obtained in every part of the visible spectrum, excepting the extreme half of the violet, as well as

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in the ultra-red. A continuous increase in the loudness of the sound was observed on removing the receiver gradually into the ultra-red. The point of maximum sound lay very far out in the ultra-red. Beyond this point the sound began to decrease, and then stopped suddenly.' Some substances, when placed in the receiver, and passed from end to end of the spectrum, give the loudest sound in the green, others in the red, and so on; from this Bell inferred 'that the nature of the rays that produce sonorous effects in different substances depends on the nature of the substances that are exposed to the beam, and that the sounds are in every case due to those rays of the spectrum that are absorbed by the body.' The principle and *modus operandi* of the S. are described as follows by Prof. Bell: 'The eye-piece of a spectroscope is removed, and sensitive substances are placed in the focal point behind an opaque diaphragm containing a slit. These substances are put in communication with the ear by means of a hearing-tube, and thus the instrument is converted into a veritable "spectrophone." Suppose we smoke the interior of our spectrophonic receiver and fill the cavity with peroxide of nitrogen gas. We have then a combination that gives us good sounds in all parts of the spectrum, visible and invisible, except the ultra-violet. Now pass a rapidly interrupted beam of light through some substance whose absorption spectrum is to be investigated, and bands of sound and silence are observed upon exploring the spectrum, the silent portions corresponding to the absorption bands.' Of the uses of the S., Bell says: 'Of course the ear cannot for one moment compete with the eye in the examination of the visible part of the spectrum; but in the invisible part beyond the red, where the eye is useless, the ear is invaluable. In working in this region of the spectrum, lamp-black alone may be used in the spectrophonic receiver. Indeed the sounds produced by this substance in the ultra-red are so well marked as to constitute the instrument a most reliable and convenient substitute for the thermopile.'

SPECTROSCOPE, *spěk' trō-skōp*: instrument by aid of which spectral phenomena (see SPECTRUM) may be most conveniently studied. The *Prism S.* consists essentially of—(1) a tube having at one (closed) end a slit to admit the light to be analyzed, and at the other end a collimating lens whereby all the rays entering through the slit are collected into a parallel bundle; (2) a prism (in more complex spectroscopes there is a train of prisms) to refract and disperse the rays; (3) a small telescope, mounted behind the prism, to magnify and define the spectrum or image so obtained. Another tube contains a scale, which is illumined, and reflected from the surface of the prism into the telescope, thus determining the position of the lines under observation. The whole apparatus is arranged on a table, with means of adjusting the tubes at the proper angles with the prism. The object of multiplying prisms is to obtain greater dispersion.—The *Grating S.*, or *Diffraction S.*, is based on the principle of Diffraction (q.v.). See SPECTRUM; SUN.

SPECTRUM.

SPECTRUM, *spěk'trŭm*: in optics, the colored image of the sun or other luminous body, produced by Refraction through a Prism (q.v.), by Diffraction (q.v.) through a fine grating, etc. This article relates only to the S. produced by a prism, both because that is commonly used, and because, so far as we have present occasion to examine it, it presents very nearly the same appearances as spectra produced by other processes.

The solar spectrum was carefully examined first by Newton, who deduced from his observations the composite nature of white light, and the different refrangibilities of its various colored constituents. A ray of sunlight enters a darkened room through a small hole, S, in a shutter. I

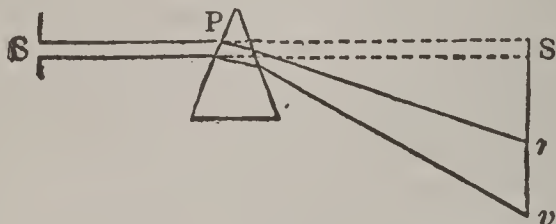


Fig. 1.

proceeds in a straight line to the opposite wall, and forms at S', as a circular white spot, an image of the sun. If the edge of a glass prism, P, be interposed in the path of this ray, the white spot at S' disappears, and the spectrum, r, v, is produced. In this form of experiment, its shape is that of a rectangle with semicircular ends, as figured below.



Fig. 2.

The breadth of the spectrum is equal to the diameter of the spot S'; and it is brilliantly colored, the end r, nearest to S', being red, and the other end, v, violet. Between these we have gradations of color, and the whole appeared to Newton divisible into seven differently colored spaces, which he called red, orange, yellow, green, blue, indigo, violet. It is impossible, however, to settle precisely the exact boundary between any two of these fancied species of color; and, besides, such a description of the spectrum (though complete enough for popular language) is totally inadequate to express our present knowledge of the subject. In order to study the spectrum more closely, suppose we have pieces of colored glass each allowing only one definite color to pass. With a red glass placed at the hole in the shutter, the prism being removed, the effect would be to render the spot S' red, without changing its position. Introduce the prism, and the effect is to change the position of the spot to r, without altering its size or color.

Similarly, with a violet glass we have a violet spot at v, and so on; the change of position, due to refraction, being least for red and greatest for violet. It thus appears that

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the spectrum formed in this way, is made up of a series of circular spots, of the various colors of which white light consists, all of the same size and having their centres ranged along a line, so that each overlaps those next it. The only parts of the spectrum which are *pure*, i.e., where no two or more colors are mixed, are the ends; so



Fig. 3.

that, by this process, it is impossible to separate definitely the rays of different refrangibility, so as to see, for instance, *whether any are wanting*. How, then, are we to ascertain whether sunlight contains rays of every refrangibility from red to violet? The obvious method is to make the spot S' not circular, but long and very narrow, a process mentioned by Newton himself. In such a case our figure would become



Fig. 4.

and, by making S' narrow enough, we shall evidently be able to avoid overlapping of the various colored images, *unless there be present, in white light, rays of every refrangibility from red to violet*. To make this spot S' thus narrow, a method commonly employed is to set the prism about half-way between the shutter and the screen, and to place before it a lens, such that, if the prism were removed, S' would be an image of the hole in the shutter nearly equal to it in size. The hole must, therefore, be a narrow slit, parallel to the edge of the prism. When this arrangement is adjusted we have a pure spectrum, and we find it to be (at first sight) *continuous*. Thus, it appears that sunlight contains rays of every refrangibility; from the highest to the lowest; and that Newton's sevenfold division of it, though sometimes convenient for popular reference, has no scientific basis. Besides, what we can see is not the whole spectrum but a mere fraction of it; for beyond the red end, there are invisible rays recognized at once by their heating powers; and beyond the violet, there are invisible rays more powerful than the visible in producing chemical changes, as on a photographic plate, and which can be changed into visible rays by fluorescent substances: see PHOSPHORESCENCE. The breadth of the visible spectrum evidently depends on the *length* of the slit, and the length of the spectrum on the difference of refrangibility of red and violet.

If the slit in the shutter be very narrow, and the prism be adjusted to the most favorable position (so that the incident and refracted rays make equal angles with the surfaces on which they impinge, and from which they es-

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cape, respectively), we see that, after all, the solar S. is *not* continuous. It is found to be crossed at intervals by dark bands (a few of which are sketched below, fig. 5), showing the absence of rays of certain definite refrangibilities. The phenomenon is found to be the same whatever be the substance of the prism: so that these rays are really wanting in sunlight.

This important discovery was made by Wollaston; but the bands were first carefully observed and measured by Fraunhofer, from whom they are commonly called *Fraunhofer's lines*. We owe to him the invaluable suggestion of employing a telescope to examine the S. The refracted rays are received directly on the object-glass of the telescope, which forms an image of the S. to be examined with the aid of the eye-piece, the screen being dispensed with. Wollaston had seen only five lines; Fraunhofer at once discovered 400; Brewster, with more perfect apparatus, counted 2,000; and now, with a train of prisms, and powerful telescopes, their number seems beyond computation. They show every variety of breadth and distinctness, and are grouped in the most irregular manner. For reference, Fraunhofer selected some of the more prominent, to which he attached the earlier letters of the alphabet. By their help he was enabled to measure refractive indices (see REFRACTION) with great precision. The same lines, though far less distinct, are seen in the same relative positions in the spectra of the moon and the planets. Dark lines are discernible in the spectra of the fixed stars also, but their position is different. Sources of light that contain no volatile constituents—e.g., incandescent platinum wire—give continuous spectra, without such lines; but if volatile substances be present, bright lines are seen in the spectrum, characteristic of the volatile substances. If the light of a candle, a bright gas-flame, a white-hot wire, or a lime-ball in the oxyhydrogen flame, be examined in the same way, *no such lines are seen*.

The first to throw any light on this class of facts was Brewster. He showed that when light passed through nitrous acid gas its S. was interrupted by countless lines; and that they increased in number and breadth on application of heat to the gas, so that at a high temperature a thin layer of this gas is *opaque to direct sunlight*. Hence it was natural to conclude that the dark bands in the solar S. are caused by absorption in some medium between us and the sun. It is to be observed, however, that this is on the supposition that light as it comes immediately from the sun would give, like that of the lime-ball or of incandescent platinum, a continuous S. But Brewster went farther. He showed that *some* of Fraunhofer's lines depend on the altitude of the sun, that is on the greater or less space of air, fog, and vapor through which his rays must pass before reaching the earth. *Some of them, then, are caused by absorption in the earth's atmosphere*.

But we must now look to another class of phenomena. A spirit-lamp flame gives a very feeble S.; and, if a little common salt be put on the wick, though the flame becomes

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instantly very much brighter, no alteration is produced on the S. except the appearance of a *bright* yellow line crossing it at the place where the dark line, called by Fraunhofer, D, appears in sunlight. On examining this line carefully, Fraunhofer found that it, like D, is double—and he verified that these two rays were exactly (so far as refractive index goes) two of those wanting in sunlight, and in the light of some of the stars.

About the same time Talbot and Herschel (q.v.) showed that the colors given by Lithia, Strontia, etc., in a spirit-flame were, like that produced by common salt, due to the production of light of several perfectly definite refrangibilities: so that the S. of the lamp-flame was crossed in each case by a series of bright lines, always the same when the same body was placed in the flame; and they suggested (1825) the application of this method to the qualitative analysis of minerals, etc., when the presence of extremely minute quantities of different bodies has to be ascertained. This was, in reality, the foundation of SPECTRUM-ANALYSIS; and the method was, we may say, almost complete so far as practice is concerned. The theory, however, was left incomplete as regards the cause of dark lines in the solar S. Foucault (1849) seems to have been the first to approach the true explanation. An experiment by him, from which, however, he drew no inferences, contains the complete theory. When salt is placed in the voltaic arc (see ELECTRIC LIGHT), the spectrum gives the double bright line (coinciding with the double dark line D) above referred to. When sunlight passes through this arc its dark line D is *strengthened*, instead of being filled up, by the yellow light from the arc as we might have expected; and when one of the white-hot carbon-points (which gives a continuous spectrum) is looked at through the yellow arc, the double dark line D appears in its spectrum.

Stokes learning, 1850, that experiments had been made by Prof. Miller of Cambridge Univ. to test with great accuracy Fraunhofer's assertion as to the exact coincidence of the double bright line of a salted flame with the double dark line of the solar spectrum, gave for the first time the physical explanation of the phenomenon. He compared the salt flame to a space full of tuning-forks or pianoforte wires all tuned to the same note. When they are in vibration they, of course, give out this note—similarly the salt-flame the *bright* lines. When, however, sounds are produced in their neighborhood, as they naturally vibrate to one definite note, they will be set in vibration by it (i.e., will absorb it) if it be part of the sound.—Thus sound which has passed through such a space has had this note eliminated from it—similarly the salt-flame seizes these yellow rays from white light passing through it. This ingenious and satisfactory explanation shows at once that the line D proves the existence of salt (or sodium) in the atmosphere of the sun. Stokes's theory was not published except so far as it was annually given by Sir W. Thomson (q.v.) in his lectures in Glasgow—so that it was independently discovered, or at least its discovery was closely

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approximated by other philosophers 8 or 10 years later. The earliest of these was Balfour Stewart, who proved by reasoning and experiment that a body's absorbing power for any ray of light or heat is equal to its radiating power for the same: Angström all but made the rediscovery: finally, Kirchhoff, by reasoning similar to that of Stewart, and by actually reversing the spectra of certain substances, arrived at the same results; and, in conjunction with Bunsen, applied them to chemical analysis, with the immediate result of discovering two new metals, cæsium and rubidium. Crookes, later, by the same method discovered thallium; and indium, gallium, and sundry earth-metals have been discovered by other chemists. The delicacy of these spectrum reactions is very considerable, but varies with the different metals; it is most striking in the case of sodium; one two-hundredth millionth of a grain of that metal gives in the spectrum the characteristic yellow line.

One of the most valuable parts of Kirchhoff's investigation is his map of the solar S. with its dark lines; side by side with which is a S. containing the bright lines given by various metals volatilized in an electric spark. The sunlight is admitted through the upper half of the slit, the light from the burning metal through the lower—thus the two are subject to precisely the same deflections by the train of prisms. The following figure shows a very small portion of Kirchhoff's drawing, and exhibits the exact coincidence of the bright lines produced by highly heated vapors of iron, magnesium, nickel, and calcium, with corresponding dark lines in the solar S. The particular portion exhibited (in the middle of the green), is chosen

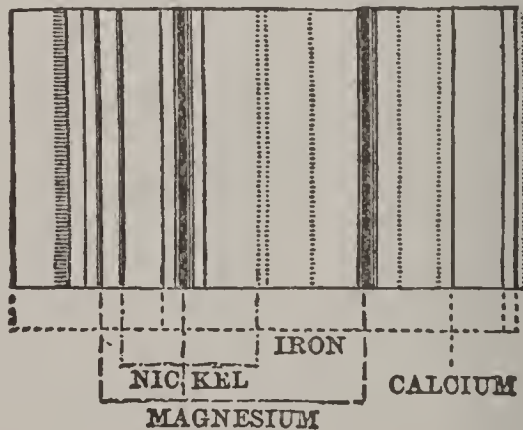


Fig. 5.

because it contains few lines whose origin has not been ascertained. But *every* bright line in the iron S. has a corresponding dark line in the solar S. Kirchhoff and Bunsen, on the basis of these observations, investigated the chemical constitution of the sun's atmosphere, by ascertaining the elements which, when in the state of incandescent vapor, develop bright spectrum lines, coinciding with Fraunhofer's lines in the solar S. The coincidence of Fraunhofer's line D with the bright yellow line of sodium seems evidence of the presence of that metal in the sun's

SPECULAR—SPECULUM.

atmosphere. Kirchhoff moreover proved that 60 bright lines in the spectrum of iron correspond, both as to position and as to distinctness most exactly with 60 dark lines in the solar S.; hence the inference that iron in the state of vapor is present in the solar atmosphere. So with regard to the bright lines of the spectra of other metals and other dark lines of the solar spectrum.

The applications of the S.-analysis are numerous. When there is much moisture in the atmosphere, the solar S. shows what is called the *rain-band*. Huggins showed that the spectra of planetary nebulæ, and of the tails of comets, consist of a few *bright* lines only—indicating that these bodies—or, at all events, those portions of them from which their light proceeds—are masses of incandescent vapors or gases. Stokes has traced, by the alteration of the absorption bands produced by the coloring matter of blood, the oxidation and reduction which constantly take place in this substance, and its connection with the distinction between venous and arterial blood: see SPECTROSCOPE.

SPECULAR: see under SPECULUM.

SPECULATE, v. *spěk'û-lăt* [L. *speculātus*, spied out, observed—from *spec'ûlor*, I behold; *speciō*, I look at. It. *speculare*; F. *spéculer*—*lit.*, to spy about]: to study a subject in its various aspects and relations; to meditate; to purchase land, stock, goods, etc., in expectation of realizing large profits by their future sale. **SPEC'ULATING**, imp. **SPEC'ULATED**, pp. **SPEC'ULATOR**, n. *-lă'tér*, one who forms theories; one who purchases goods, etc., in expectation of being able to sell them again at a large profit; in *OE.*, examiner; spy. **SPEC'ULA'TION**, n. *-lă'shùn* [F.—L.]: a train of thoughts arising in the mind from viewing a thing in various aspects and relations; intellectual examination; contemplation; mental scheme not reduced to practice; a theory; the act or practice of purchasing goods, etc., out of the regular order of trade, in expectation of being able to sell them at a large advance in price; in *OE.*, examination by the eye; view; power of sight. **SPEC'ULATIVE**, a. *-lă-tív*, given to speculation; ideal; theoretical; in *OE.*, belonging to view. **SPEC'ULATIVELY**, ad. *-lě*. **SPEC'ULA'TORY**, a. *-lă'tér-ě*, exercising speculation.

SPECULUM, n. *spěk'û-lŭm* [L. *spec'ûlum*, a mirror—from *speciō*, I look at]: metallic reflector; mirror or looking-glass; in *surg.*, instr. for keeping open certain parts of the body that they may be attentively examined. **SPEC'ULAR**, a. *-lér*, resembling a speculum; having a smooth reflecting surface; in *OE.*, affording a view. **SPECULUM METAL**, alloy of copper and tin with a little arsenic, or of steel and platinum; used in making the specula of reflecting telescopes: the best consists of 10 parts of copper to one of tin, or of equal parts of steel and platinum. To obtain the alloy perfect, and to cast it successfully, are exceedingly difficult, requiring much skill and experience. See TELESCOPE. **SPECULAR IRON**, an ore of iron, occurring frequently in crystals, of a brilliant metallic lustre.



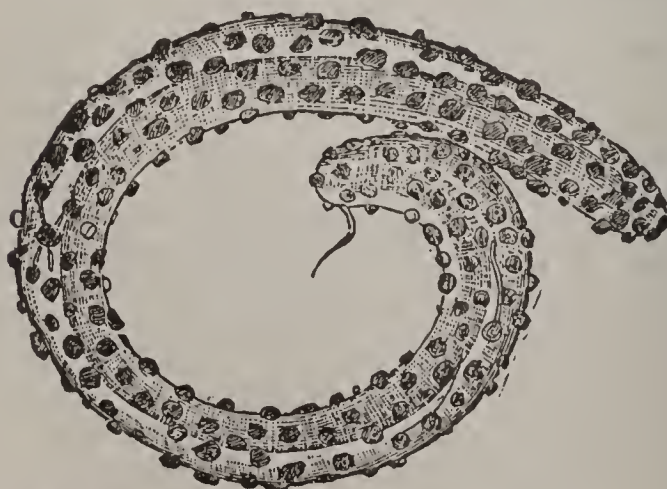
Germander Speedwell (*V. Chamædrys*).



Ancient Spears.



ss. Spanker.



Sphærolaria bombi, Male and Female.

SPED—SPEEDWELL.

SPED *spĕd*: pt. pp. of the v. **SPEED**, which see.

SPEECH, n. *spĕch* [Icel. *spækja*, speech: Ger. *sprechen*, to speak: Bav. *spächten*, to speak; *spacht*, speech (see **SPEAK**)]: the faculty of speaking; the expression of thoughts by words or articulate sounds; language; anything spoken; harangue; an oration; a formal discourse; talk. **SPEECHLESS**, a. *-lēś*, without power of speech; dumb; silent. **SPEECHLESSNESS**, n. *-nĕś*, the state of being speechless. **SPEECH-MAKER**, one who makes speeches; one accustomed to speak in public. **SPEECHIFY**, v. *spĕch'ĭ-fi* [Eng. *speech*, and L. *faciō*, I make]: to harangue, generally used in contempt. **SPEECHIFYING**, imp. **SPEECHIFIED**, pp. *-fid*. **SPEECHIFICA'TION**, n. *-fi-kū'shŭn*, the act of speechifying.

SPEECH-SOUNDS: see **PHONETIC ALPHABET**: also **SPELLING REFORM**.

SPEED, n. *spĕd* [AS. *spēdan*, to succeed, to prosper: Low. Ger. *spoden*, to haste: Dut. *spoed*, speed: OHG. *spuot*, success]: quickness of motion; haste; rapid action; swiftness; success: V. to hasten; to make haste; to send away quickly; to accelerate; to have success; to assist; to prosper; to fare well or ill; in *OE*, to have good success; to succeed well or ill; to destroy; to ruin. **SPEED'ING**, imp. **SPED**, pt. pp. *spĕd*, did speed. **SPEEDY**, a. *spĕd'ĭ*, quick; prompt; not dilatory or slow. **SPEEDILY**, ad. *-ĭ-lĭ*, with haste; quickly. **SPEED'INESS**, n. *-nĕś*, the quality of being speedy; quickness; haste. **GOD SPEED YOU**, or **GOOD SPEED**, may you have good success.—**SYN.** of 'speed, n.': celerity; quickness; dispatch; expedition; acceleration.

SPEED'WELL (*Veronica*): genus of plants of nat. order *Scrophulariaceæ*, distinguished by a 4-cleft wheel-shaped corolla, with the lower segment narrower, two stamens, and a two-celled capsule. The species are very numerous, annual and perennial herbaceous plants and small shrubs, natives of temperate and cold climates in all parts of the globe. Some grow in wet ditches and in marshes, some only on driest soils. They have generally very beautiful blue, white, or pink flowers. Few wild-flowers are more beautiful than the Germander S. (*V. Chamædrys*), or the alpine species, *V. alpina* and *V. saxatilis*. A number of species are cultivated in flower-gardens.—The bitter and astringent leaves of the **COMMON S.** (*V. officinalis*), found in almost all n. parts of the world, are in some countries used as tonic, sudorific, diuretic, and expectorant medicine. They are used also, particularly in Sweden, as substitute for tea; as are leaves of the **Germander S.**—*V. Virginica* is called *Calver's Physic* in this country; it is said to be actively diuretic, and a decoction of the fresh root is violently cathartic and emetic.—**Book-time** (q.v.) belongs to this genus.

SPEIER—SPEIRANTHY

SPEIER, or **SPEYER**, *spī'ér* or *spīr* (F. *Spïres*): capital of Rhenish Bavaria (the former Palatinate), and one of the oldest towns in Germany; at the influx of the Speyerbach into the Rhine, 14 m. s.w. of Heidelberg, 23 n. of Carlsruhe. It is a station on two railways—Schifferstadt and Germersheim, and Heidelberg and Speier. The principal building is the cathedral (founded 1030), which contains the tombs of numerous emperors of Germany: since 1856 it has been wholly renewed, and is the grandest specimen of Romanesque architecture in Europe; it has a hall of Roman antiquities discovered in the Palatinate, and is adorned with 30 magnificent frescoes by Schraudolph.

Except the cathedral and a ruined wall, the sole relic of the imperial palace in which 29 diets were held—at one of which (1529) the Reformers made their famous 'protest,' and got for themselves the name Protestants (see **PROTESTANT**)—S. contains no ancient buildings: the cause is, that in the Orleans Succession War—well called by the Germans the *Mordbrenner Krieg*—during which the whole Palatinate was savagely wasted, S. was taken by the French, its inhabitants driven out, and the city blown up with gunpowder and burned to the ground. Only the cathedral resisted the barbarous efforts to mine it. Everything else was reduced to rubbish, and for long years the noble old pile overlooked nothing but a melancholy waste of ruins. In 1794 it was again wasted by the French under Custine; and has never recovered from these calamities. S. manufactures tobacco and cigars, shoes, machinery, paper, cutlery; and has some transit-trade on the Rhine. Pop. (1890) 17,585, of whom about half are Rom. Catholics.

S., the *Noviomagus* of the Romans, was the cap. of the Nemetes, a German people. S. was probably the native name from the first, for in some later Roman notices (7th c.) it is called *Civitas Nemetum, id est Spira*. A Christian community appears to have been established here as early as 150–200, and it was certainly the seat of a bp. about 300. The German emperors had here a *pfalz* (palace, Lat. *palatium*, whence the former name of the region of which it was the capital, the Pfalz or Palatinate), in which they often resided. By them the town was made a Free City of the Empire; and having obtained the monopoly of the carrying-trade up and down the Rhine, it rapidly rose in wealth and importance. The *Reichskammergericht*, or imperial chamber of justice, the highest court of the German empire, was held here for 200 years, until removed to Weizlar 1689.

SPEIR, v. *spēr* [AS. *spyrian*; Icel. *spyrja*, to search out by the track or trace, to inquire—from *spor*; D. *spoer*; Ger. *spur*, a track]: to make diligent inquiry; to ask; to inquire: N. an inquiry; an object sought.

SPEIRANTHY, n. *spīr'ān-thī* [Gr. *spoira*, a twist or curl; *anthos*, a flower]: in *bot.*, the twisted growth of the parts of a flower.

SPEISS—SPELL.

SPEISS, n. *spîs* [Ger. *speise*, mixed metal]: compound obtained in smelting the lead ores of certain localities, especially those from Freiberg in Saxony: it consists mainly of arsenic and iron, but often contains cobalt and nickel.

SPEKE, *spêk*, JOHN HANNING: African traveller: 1827, May 4—1864, Sep. 15; b. at Jordans, near Ilchester, Somersetshire, England. He was educated at the Barnstaple grammar school, and at the age of 17 went to India. He entered the native Bengal infantry as a cadet, and saw much service during the war in the Punjab. A keen sportsman, with a taste for natural history, he employed his rifle in collecting for the museums specimens of the rarer mammals and birds of India, and with this view he undertook several exploratory trips into the Himalaya. While so employed, he conceived his purpose of African travel. The English government had resolved, 1854, to dispatch an expedition from Aden into the neighboring region of Africa, under command of Capt. Burton (q.v.). S., then a lieut. in the Indian army, reached Aden at this time on leave of absence, and resolved to join Burton and his companions, Lieuts. Herne and Stroyan. Burton went to Harar; and S. was detached to visit the Dalbahantas, the most warlike of the Somauli tribes. On the return of the travellers to their starting-point on the coast, they were attacked by 150 men. Stroyan was killed, and S. made a narrow escape with 11 wounds. The attention of the Geographical Soc. of London had now been called to the great lakes of tropical Africa; and 1857, June, they dispatched Burton and Speke, who entered the country from Zanguebar, as the German missionaries Krapf and Rebmann had done 1847; and discovered the great lake Tanganyika. In returning to the coast, Speke marched alone to the northward, and discovered the Victoria Nyanza. In 1860 he returned to Africa, accompanied by Capt. Grant, to confirm his former discovery, when he explored the w. and n. shores of Nyanza, and discovered an outlet northward: see NILE. On their return to England 1863, they met an enthusiastic reception. The substantial correctness of the geographical discoveries of S. has been established by Henry M. Stanley, who sailed round the Victoria Nyanza 1876. S. was killed by a gun-accident while out shooting in the neighborhood of Bath, to which he had come to be present at a meeting of the Brit. Assoc.—S. is author of a *Journal of the Discovery of the Source of the Nile*; and *What Led to the Discovery of the Source of the Nile*.

SPELDINGS, n. *spêl'dîngz*, or **SPEL'DRONS**, n. *-drônz* [from root of SPELL 2]: in *Scot.*, haddocks or whittings cured and dried in a particular way.

SPELICANS, n. plu. *spêl'î-kânz* [O.Dut. *spelleken*, a small pin (see SPELL 2)]: a game played with thin slips of wood or ivory.

SPELL, n. *spêl* [Icel. *spilda*, a piece of anything: Low Ger. *spall*, a portion of land; *spiel*, a game]: continuance; duration; space; a bout or pull; a turn of work; a job: V. to take another's place, as in labor.

SPELL—SPELLING REFORM.

SPELL, v. *spēl* [Dut. *spell*, a splinter of wood; *spellen*, to spell, pointing out the letters with a *spill*, or splinter of wood]: to tell the letters of a word one by one; to write or print words with their proper letters; in *OE.*, to relate; to teach; to read. **SPELL'ING**, imp.: N. the act of naming the letters of a word; orthography. **SPELLED**, pp. *spēld*, or **SPELT**, pp. *spēlt*. **SPELLING-BOOK**, a book for teaching children to read and spell.

SPELL, n. *spēl* [AS. *spellian*, to recite]: any form of words which, when recited, were supposed to possess magical power; a charm: V. to charm by reciting a form of words. **SPELL'ING**, imp.: ADJ. acting as a spell or charm. **SPELLED**, pp. *spēld*. **SPELLBOUND**, a. arrested or locked up by a spell or charm.

SPELLING REFORM: systematic attempt to represent more simply, in writing and print, the accepted pronunciation of words. The system, however, is intended as only partial and tentative, for present application. For radical schemes, to symbolize elementary or compound sounds not distinguishable in current spelling of the English language, see **PHONETIC ALPHABET**. Here are noticed only the moderate or provisional efforts to correct the more gross anomalies and superfluities of our spelling, by dropping or changing the use of certain letters of our present alphabet.

A freedom that would be delightful now to those who have an innate, if not an illiterate, inability to spell correctly according to best usage, existed before the 18th c. Writers often spelled the same word differently in the same text or even paragraph. Dr. Johnson's Dictionary (1755) marked the era of uniformity without reform, though for a century previous there had been a tendency to simplicity. The first innovation in this country was Noah Webster's *American Dictionary* (1828); but his changes, decried, yet largely adopted, were mostly in carrying out in his vocabulary a few reforms already in progress or recommended by previous lexicographers, such as dropping the Norman French *u* from *favour*, etc.; changing the French *metre*, etc., to *meter*; omitting a consonant where it is doubled in an unaccented syllable, e.g., *travelling*; retaining it where it belonged to a word with suffix, e.g., *dullness*; following derivatives in the use of *s* or *c*, e.g., *expense*; and dropping *u* from *mould*, as had been done in *gold*, etc. (AS. *molde* and *gold*).

The S. R. Assoc. was organized at an international convention. Philadelphia 1876, as the result of discussions here and abroad for years previous; and the English assoc. was formed three years later. By both societies the following changes were recommended for general adoption 1884:

1. Drop silent *e*, e.g., in *vineyard*, *live*, etc.
2. Drop *a* from *ea* in *feather*, etc., and drop *e* from *ea* in *heart*, etc.
3. For *beauty* use the old word *beuty*.
4. Drop *o* from *eo* in *leopard*, etc. For *yeoman* write *yoman*.
5. Drop *i* in *parliament*.
6. Write *u* where *o* has the *u* sound, e.g., in *above*. For *women* write *wimen*.
7. Drop *o* where *ou* sounds *u*, as in *journal*.
8. Drop silent *u* after *g* in *guess*, etc.

SPELT—SPENCER.

Drop final *ue* in *catalogue*, etc. 10. For *rhyme* write *rime*. 11. Not double final consonants, except in *all* and *shall*, nor medial ones, as in *battle*, nor initial where prefix is unaccented, as in *abbreviate*. 12. Drop silent *b* in *plumb*, etc. 13. Change *c* back to *s* in *cinder*, *fierce*, *hence*, *once*, *pence*, *scarce*, *since*, *source*, *thence*, *tierce*, *whence*. 14. Drop *h* of *ch* in *chamomile*, *cholera*, *cholera*, *melancholy*, *school*, *stomach*. 15. Change final *d* and *ed* to *t* when so pronounced, as in *crossed*, *looked*, except when the *e* affects the preceding sound. 16. Drop *g* in *feign*, *foreign*, etc. 17. Drop *h* in *aghast*, *burgh*, *ghost*, and *gh* in *haughty*, *though* (*tho*), and the like. 18. Drop *l* in *could*; and, 19, *p* in *receipt*; and, 20, *s* in *aisle*, *island*, *demesne*, and change *s* to *z* in the verbs *abuse*, *rise*, etc. 21. Drop *c* in *scent*, *scythe* (*sithe*), and, 22, *t* in *catch*, *pitch*, etc., and, 23, *w* in *whole*. 24. Write *f* for *ph* in *philosophy*, *sphere*, and the like.

For those who would take only a first step, rules 1, 2, 11, 15, and 24 are recommended. Some periodicals, in the west especially, have taken this step. The reform, if ever adopted generally, must be gradual, and cannot be enforced as a S. R. has been in Germany (school-books) since 1880. The S. R. in English publishes a number of periodicals to advocate and exemplify itself.

SPELT, v.: see under SPELL 2.

SPELT, n. *spělt* [AS. *spelt*, grain, corn]: an inferior kind of wheat of France and Flanders; the rye and fitches of the Bible; the *Triticum spelta*, ord. *Gramin'ĕæ*; *T. monococcum* is a variety of spelt called St. Peter's corn. See WHEAT.

SPELTER, n. *spěl'tér* [Low Ger. *spialter*; Dut. *spiauter*, spelter]: zinc in thick plates or masses, usually unrefined: see ZINC.

SPENCE, n. *spěns* [OF. *despenser*, to spend—from L. *dispensus*, weighed out; *dispendĕrĕ*, to weigh out—from *dis*, apart; *pendĕrĕ*, to weigh]: in OE., and *prov. Eng.*, a cupboard; a safe; a convenient place in which to keep the provisions of a house; a pantry; in *Scot.*, a sitting and eating room.

SPENCER, n. *spěn'sér* [named after the third Lord *Spencer*, who first wore it]: a short over jacket, worn either by men or women.

SPENCER, n. *spěn'sér* [etym. doubt.]: in *naut.*, a four-cornered fore-and-aft sail, whose head is extended by a gaff and its foot usually by a sheet. Its position is abaft the fore or the main mast, and it is frequently bent to a spencer-mast. It is a trysail to the fore or main mast, and differs from a spanker or driver in position. The latter belong to the mizzen. SPENCER-MAST, n. small mast abaft a lower mast for hoisting a trysail.

SPENCER.

SPENCER, *spěn'sér*: town, one of the caps. of Worcester co., Mass.; on the Boston and Albany railroad; 11 m. s.w. of Worcester. It has 5 churches, large hotel, high and graded public schools, public library, lyceum, 1 national bank (cap. \$150,000), 1 savings bank, and 2 weekly newspapers. The town is noted for its manufactures, chiefly boots and shoes, woolen goods, and wire. Pop. (1880) 7,466; (1890) 8,747; (1900) 7,627.

SPENCER, **GEORGE ELIPHAZ**: 1836, Nov. 1—1893, Feb. 19; b. Jefferson co., N.Y. He was educated in Canada; admitted to the bar in Io. 1856; elected sec. of the state senate 1858; entered the Union army as asst. adjt. gen. 1862; recruited the 1st Ala. cav., of which he became col. 1863; was brevetted brig. gen. and resigned 1865. In 1867 he was elected U. S. senator from Ala. as a republican, served till 1879, and was active in exposing the star-route frauds and in promoting legislation for the reduction of letter postage to two cents. He was appointed commissioner of the Union Pacific railroad 1881, and afterward engaged in mining and cattle-raising in Nevada.

SPEN'CER, **HERBERT**: English philosopher, who has attempted to work out a complete system of philosophy in harmony with the principles and results of modern science: b. Derby, 1820. His father, schoolmaster in that town, about 1814 became hon. sec. of the Derby Philosophical Assoc., which had been founded by Dr. Erasmus Darwin. From his father, S. imbibed that love of natural science and wonderful faculty of observation so conspicuous in his works. The father seems to have been interested chiefly in entomology; and S. used to collect, describe, and draw insects when a boy. Rejecting the Cambridge career recommended by his uncle, the Rev. Thomas S.—a clergyman well known for liberal opinions on social and political questions—he became a civil engineer at Derby at the age of 17; but about eight years afterward gave up this profession, having gradually entered on journalistic and literary work. He had already contributed various papers to the *Civil Engineers' and Architects' Journal*; and in the latter half of 1842 he wrote a series of letters to the *Nonconformist* newspaper on 'The Proper Sphere of Government,' republished in pamphlet 1843. These letters imply a belief in human progress based on the modifiability of human nature through adaptation to its social surroundings, and maintain the tendency of these social arrangements 'of themselves to assume a condition of *stable equilibrium*.' He was engaged on the *Economist* newspaper 1848-53, and at this time he developed the ethical and political consequences of the ideas that he had enunciated; and sought an independent basis for them in his first important work, *Social Statics* (1850). It is thus noticeable that S.'s philosophical activity began with ethical and social questions. The evolution of man and society as determined by circumstances, and the idea that organic and social evolutions are under the same law, *preceded* the elaboration of those scientific ideas which, in the complete *System of Philosophy*, are made to serve as their basis. The

truth anticipated by Harvey and Wolff, but first put into definite shape by Von Baer—‘the truth that all organic development is a change from a state of homogeneity to a state of heterogeneity’—is regarded by S. as the organizing principle of his subsequent beliefs. It was gradually developed and applied by him in a series of articles contributed in the following years to the *Leader*, the *North British*, *Medico-Chirurgical*, *Westminster*, and other reviews.

In these essays, especially those on *Manners and Fashion* (1854), and *Progress: its Law and Cause* (1857); and in the volume *Principles of Psychology* (1855), the doctrine of evolution began to take definite form, and to be applied to various departments of inquiry. The publication of Darwin's *Origin of Species*, 1859, gave a wide basis of scientific evidence for what had been mere speculation, and first showed the important part played by natural selection in development.

In 1864 S. published an essay on the *Classification of the Sciences*, in which he criticised Comte's serial arrangement of the sciences according to generality, and substituted for it a classification according to abstractness: (1) *Abstract Science*, treating of the forms (space and time) in which phenomena are known to us—logic and mathematics; (2) *Abstract-Concrete Science*, treating of the laws of the factors of the phenomena themselves—mechanics, physics, chemistry, etc.; (3) *Concrete Science*, treating of the phenomena in their totalities (the laws of the products)—astronomy, geology, biology, psychology, sociology, etc.

On this scheme of the sciences, S. had now been working for several years. As early as 1860 he had announced the issue of a *System of Synthetic Philosophy*, already in preparation; which, beginning with the first principles of all knowledge, proposed to trace how the law of evolution was gradually realized in life, mind, society, and morality. In pursuance of this comprehensive design, S. has published *First Principles* (1861); *Principles of Biology*, 2 vols. (1864–67); *Principles of Psychology*, 2d ed., 2 vols. (1870–72); *Principles of Sociology*, vol. I. (1876); ‘Ceremonial Institutions’ (1879), and ‘Political Institutions’ (1882), composing vol. II.; ‘Data of Ethics,’ being Part I. of *Principles of Morality* (1879).

In method, S.'s philosophy is essentially speculative or deductive. It does not begin with observation and experiment, and rise through them to scientific generalizations. Its starting-point is certain truths supposed to be ultimate and the source from which all others are to be deduced; and its justification is sought in its ability to explain phenomena from its assumed standpoint. This is due not merely to the adoption of the synthetic form of exposition. The ultimate test is in all cases the mental inconceivability of the opposite of the proposition by the individual thinker.

Metaphysically, S.'s system is founded on the doctrine of relativity which Hamilton (q.v.) and Mansel (q.v.) deduced from Kant (q.v.), but carried, as he says, a step further. With the definite consciousness of things known in rela-

tion to one another, there is implied an indefinite consciousness of an absolute existence, in the recognition of which as inscrutable, science and religion find their reconciliation. All definite consciousness or knowledge is of the manifestations of this unknowable power; and knowledge, completely unified, is philosophy. The data of philosophy are necessarily those organized components of our intelligence without which philosophizing could not go on. 'Our postulates are: an unknowable power; the existence of knowable likenesses and differences among the manifestations of that power; and a resulting segregation of the manifestations into those of subject and object.' Within each segregated mass there are likenesses and differences involving secondary segregations. The modes of cohesion under which manifestations are invariably presented are called, when contemplated apart, space and time; when contemplated with their manifestations, matter and motion. All these are traceable to experiences of that mode of consciousness whose reality is shown by its persistence—to force. By the 'persistence of force' is meant, the unchanging quantity both of that mode of force which is revealed to us only by opposition to our own powers, and is not a worker of change; and of that mode which is a worker of change actual or potential, and is specifically termed energy. The persistence of force—that is, the persistence of some cause which transcends our knowledge and conception—is the truth which all other truths imply, and from which they all (including the law of evolution) are derived. From the fact that force can neither arise out of nor lapse into nothing, follows the uniformity of law. Force never disappears; it is only transformed. Motion follows the line of least resistance, and is perpetually reversed within limits—is rhythmical. So far of the factors of phenomena. The phenomena themselves must be under a law of the concomitant redistribution of matter and motion, which holds of every change. The law of the entire cycle of changes passed through by every existence is loss of motion and consequent integration, i.e., evolution, eventually followed by gain of motion and consequent disintegration, i.e., dissolution. In its complete shape, the 'formula of evolution' is thus stated: 'Evolution is an integration of matter and concomitant dissipation of motion; during which the matter passes from an indefinite incoherent homogeneity to a definite coherent heterogeneity; and during which the retained motion undergoes a parallel transformation.' This law of evolution applies equally to all orders of phenomena—whether 'astronomic, geologic, biologic, psychologic, sociologic, etc.'—since these all are component parts of one cosmos, though distinguished from one another by conventional groupings. So long as evolution is merely established by induction, it does not belong to philosophy. It must be deduced from the persistence of force. And this can be done. For any finite aggregate being unequally exposed to surrounding forces will become more diverse in structure; every differentiated part will become the parent of further dif

ferences; at the same time, dissimilar units in the aggregate tend to separate, and those which are similar to cluster together ('segregation'); and this subdivision and dissipation of forces, so long as there are any forces unbalanced by opposite forces, must end at last in rest; the penultimate stage of this process, 'in which the extremest uniformity and most complex moving equilibrium are established,' being the highest conceivable state.

The various derivative laws of phenomenal changes being thus deducible from the persistence of force, it remains to apply them to inorganic, organic, and super-organic existences. The detailed treatment of inorganic evolution being omitted from S.'s plan, he proceeds 'to interpret the phenomena of life, mind, and society, in terms of matter, motion, and force.'

It is impossible to give here any but the most general idea of the contents of the volumes in which the law of evolution is applied to these different departments. It is made not only to account for the phenomena within each group, but also for the connection between one science and another. The researches of Darwin had accumulated ample material for showing the continuity of development, structural and functional, in plants and animals; and S.'s view of biology, and the definition of life that he proposes ('the definite combination of heterogeneous changes both simultaneous and successive in correspondence with external co-existences and sequences'), are meant to show its connection both with inorganic changes on the one hand, and with mind on the other. Now, just as biology has to deal with the connection between phenomena in the organism, and as physical science treats of the connection between phenomena in the environment, so psychology has to do with the connection between these two connections. For this is said to be the objective aspect of what states of consciousness are subjectively. The functions dealt with by the psychologist are more special than those dealt with by the biologist; but they belong to psychology, not merely because they are more special, but also because they are the counterparts of the states of consciousness dealt with by the science of subjective psychology.

Objectively, an attempt is made to trace the evolution of mind from reflex action through instinct to reason, memory, feeling, and will, by the interaction of the nervous system with its environment. Subjectively, mental states are analyzed, and it is contended that all of them—including those primary scientific ideas, the perceptions of matter, motion, space, and time, assumed in the *First Principles*—can be analyzed into a primitive element of consciousness, something which can be defined only as analogous to a nervous shock. These perceptions have now become innate in the individual. They may be called—as Kant called space and time—forms of intuition; but they have been acquired empirically by the race through the persistence of the corresponding phenomena in the environment, and from the accumulated experiences of each individual.

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being transmitted in the form of modified structure to his descendants.

This principle of heredity is one of the laws by which individuals are connected with one another into an organic whole; and we thus pass quite naturally to what S. calls superorganic evolution, implying the co-ordinated actions of many individuals, and giving rise to the science of sociology. Society, like an individual man, is shown to be an organism from the fact and laws of its growth, the nature of its activities, and the interdependence of its parts; though it is distinguished from the individual organism in this, that it is discrete, while the latter is concrete: 'there is no social sensorium.' As societies advance in size and structure, they work on one another profound metamorphoses, now by war-struggles and now by industrial intercourse.

Assisted by a series of elaborate ethnographical charts (*Descriptive Sociology*) prepared under his direction, S. has attempted to trace the development of human ideas, customs, ceremonial usages, and political institutions. The genesis of religion is traced to ancestor-worship, or generally to worship of the dead. The notion of another life—from which those of gods and God are gradually evolved—is originated mainly by 'such phenomena as shadows, reflections, and echoes'—these being regarded as indications of a 'double' or other self, which is not extinguished with the death of the first self. It is this fear of the dead which is the root of the religious control, just as it is the fear of the living which is the root of the political control. Ceremonies and institutions alike have their root in this fear of the stronger and submission to the conqueror. Thus, early communities being of the predatory or militant type, tended to centralized control; while industrial communities, which are now gaining ground, tend to free institutions and to the restriction of the sphere of government to the negative duty of preventing interference (*laissez faire*). A still higher type than the industrial is possible in the future, by inverting the belief that life is for work into the belief that work is for life; just as the industrial inverts the belief that individuals exist for the state into the belief that the state exists for individuals.

The principles of morality are regarded by S. as the keystone of his system, all his other investigations being only preliminary to them. Ethics he considers as rooted in physical, biological, psychological, and social phenomena; for by them the conditions of human activity are prescribed and supplied. The best conduct is that which most fully realizes evolution—which promotes the greatest totality of life in self, offspring, and fellow-men—the balance of egoism and altruism being attained by a compromise between these contending principles. The measure of life is said to be pleasure, but the Utilitarian school are at fault in assuming that the end (greatest happiness) is better known than the means to it (morality), and for ignoring the fact that accumulated experiences of utility have become consolidated in the race into a moral sense.

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In the above summary, it has been impossible to give any idea of either the strength or weakness of the proof by which this elaborate system is supported. In general, it may be said that its strength lies in the author's brilliant power of generalization, his acquaintance with various departments of science, and his unsurpassed wealth of illustration. But a clear analysis of the notions that he employs is often lacking. Hence the unsatisfactoriness of the distinction between definite consciousness, or knowledge, and the indefinite consciousness implied by it, which is not knowledge; the want of any proved relation between his objective and subjective aspects of psychology; the implicit assumption at the outset of the perceptions of space, etc., when the attempt is being made to show how they have been gradually produced in the mind, by the action of the environment. Thus, too, in the *Sociology*, the ethnographical method is followed to the exclusion of the more scientific historical method; and in the *Data of Ethics*, the compromise between egoism and altruism is left wholly indeterminate. Besides the works already mentioned, S. is author of a volume on *The Study of Sociology* (1872), and of a book on *Education* (1861). His occasional papers have been collected and published in four volumes of *Essays: Scientific, Political, and Speculative*.

The wide knowledge which all his writings display of physical science, and his constant endeavor to illustrate and support his system by connecting its positions with scientific facts and laws, have given his philosophy great currency among men of science—more so, indeed, than among philosophical experts. At the same time, not only have the development and application that he has given to the theory of evolution, profoundly influenced contemporary speculation, but he must also be regarded as one of the few in history who have carried out the attempt to give a systematic account of the universe in its totality. S. has founded a school of thought in America; and to it is due one of the best philosophical treatises adopting his principles—the *Outlines of Cosmic Philosophy*, by John Fiske. In 1896, Nov. 14, S. published vol. III of his *Principles of Sociology*, completing the series of philosophical works begun 36 years before, and aiming to show in detail the unity of all knowledge.—See DARWINIAN THEORY: DESCENT OF MAN: SPECIES: ANTHROPOLOGY: ETC.

SPENCER, ISABOD SMITH, D.D.: 1798, Feb. 23—1854, Nov. 23; b. Rupert, Vt.: Presb. minister. Graduated at Union Coll., he was master of a grammar school in Schenectady, N. Y., and of Canandaigua Acad. 1825; colleague of the Rev. Solomon Williams, First Church (Congl.), Northampton, Mass., 1826–32; pastor of the Second Presb. Church, Brooklyn, N. Y., 1832–54. His preaching had great pungency and directness. He was one of the projectors of Union Theol. Seminary, and lectured on sacred hist. He declined the presidencies of Hamilton Coll. and Alabama Univ. His most noted publication was a volume of *Pastor's Sketches*, which had extensive circulation.

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SPEN'CER, JOHN CANFIELD, LL.D.: 1788, Jan. 8—1855, May 18; b. Hudson, N. Y.; son of Judge Ambrose S. Graduated at Union Coll. 1806, he was private sec. of Gov. Tompkins 1807; admitted to law practice at Canandaigua 1809; judge-advocate in the army 1813; district atty. of w. N. Y. 1815; dem. mem. of congress 1817-19, and author of the committee report on the U. S. Bank; mem. of the N. Y. assembly, and one year speaker of the same 1820-1; state senator 1824-28, and leader of 'the Clinton faction'; anti-Mason, and special atty. on the Morgan case, resigning from it 1830; sec. of state and state supt. of schools 1839-40; regent of Union Coll. 1840; U. S. sec. of war 1841-43, becoming sec. of the treasury, but resigning on account of the annexation of Texas 1844. He was a mem. of various state commissions, among others on the revision of the statutes. He was author of preface and notes for De Tocqueville's *Democracy in America*, and, with colleagues, of the Revised Statutes of the State of New York.

SPEN'CER (JOHN CHARLES SPENCER), third Earl; better known by his courtesy-title, LORD ALTHORP: English statesman: 1782, May 30—1845, Oct. 1; b. Spencer House, London; son of the second earl.—The founder of the family of Spencer was the Hon. John S., youngest son of the third Earl of Sunderland, by Anne, daughter and co-heiress of the great Duke of Marlborough; he inherited much property from his grandmother, Sarah, Duchess of Marlborough. His only son was made Earl S. 1765.—The second earl, GEORGE JOHN S., D.C.L. (1758-1834), was first lord of the admiralty in Pitt's administration—1794-1801—the period of the great naval victories of Camperdown, Cape St. Vincent, and the Nile: he retired when Addington became premier, and became distinguished as a munificent collector of rare books.

The third Earl S.—subject of this notice—was educated at Harrow School, and afterward at Trinity College, Cambridge. He entered parliament 1804 as member for Oakhampton. In 1806 his father took office as sec. of state for the home dept. in the Grenville-Fox ministry, and S. became a junior lord of the treasury. He sat in parliament for Northamptonshire from 1806 until the period of the Reform Bill. He went out with the whigs 1807, and during their long exclusion from office, steadily opposed the tory govt. On the dissolution of the Wellington cabinet 1830, Nov., S. was appointed chancellor of the exchequer and leader of the house of commons in the celebrated Reform ministry of Earl Grey. The Reform Bill was introduced by Lord J. Russell (q.v.), but the task of carrying the bill devolved mainly on S. In 1833 he brought in and carried the ministerial bill for reforming the Irish Church. In this memorable working session, the curious statistician discovered that S., who had, from his post of ministerial leader, naturally been the most frequent speaker, had addressed the house 1,026 times, his speeches occupying 387 columns in the then *Mirror of Parliament*. In 1834 he introduced and carried

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the Poor-law Amendment Act. When the Irish Coercion Bill was under consideration in the cabinet, S. had opposed the clauses prohibiting public meetings, yet had given way rather than break up the ministry; but when the truth was elicited in debate by O'Connell, S. resigned. He was Earl Grey's 'right-hand man,' without whose aid the earl felt himself unable to carry on the govt. Under Viscount Melbourne, S. consented to resume his office. 1834, Nov., he was called by the death of his father to the house of peers, which had the effect of bringing the Melbourne (q.v.) administration to an end. When the attempt of Sir R. Peel to carry on the govt. failed, S. declined to take office again. He gave his time to agricultural pursuits, and suggested the formation of the Royal Agri. Soc., of which he was elected pres. 1838. He died at his seat, Wiseton Hall, Notts, without issue; and was succeeded by his brother. During his political career, his absolute simplicity of character and integrity of purpose obtained for him the appellation 'Lonest Lord Althorp.' He was not an orator; but his integrity and his clear and practical intellect gave him supreme influence over the reformed house of commons. It was said by Lord Hardinge that Lord Althorp nullified the effect of a strong speech by Croker by his mere statement that some statistics which he had collected refuted Croker's views, but that he had lost them; the house accepted his statement as a substitute for the statistics. Lord Brougham dedicated to him his work on *Natural Theology*, and his *Dialogues on Instinct* are supposed to be carried on with S.—See *Memoir* by Sir Denis Le Marchant, Bart. (London 1876).

SPENCER (JOHN POYNTZ SPENCER), Earl, K.G., LL.D.: statesman: b. Spencer House, London, 1835, Oct. 27; son of the 4th Earl S.; grandson of the 3d earl, John Charles S. (q.v.). He was educated at Harrow School and Cambridge; in 1857 was M.P. for a few months, but in Dec. succeeded to the earldom. He was lord-lieut. of Ireland 1869-74, Feb., under Gladstone's administration; and again 1882, May 4—1885, June. On the evening of his arrival in Dublin 1882, May 6, Cavendish and Burke, chief sec. and under-sec., were assassinated, and it fell to S.'s lot to administer the provisions of the stringent Crimes Act then in force: in these difficult circumstances S. acted with equal firmness and moderation. When Gladstone was restored to power 1886, S. became lord pres. of the council in the liberal cabinet. In the split in the liberal party, S. stood with Gladstone for Irish home-rule.

SPENCER, JOSEPH: 1714-1789, Jan. 13; b. E. Had-dam, Conn.: revolutionary soldier. He was educated for the law; became judge of probate 1753; maj. in the army 1758; brig.gen. in the continental army, 1775; and maj.gen. 1776; commanded the expedition against the British in R. I. 1777; and, because of an order of congress to inquire into the reasons of his failure, resigned 1778, June 14. In 1779 he was elected a member of congress, and from 1780 till his death was a member of the Conn. council.

SPENCER GULF—SPENER.

SPENCER GULF: very large inlet on the coast of S. Australia (q.v.), between Eyria Peninsula on the w. and Yorke Peninsula on the e.; about 209 m. in length, by 100 m. in greatest breadth.

SPEND, v. *spēnd* [AS. *spendan*, to spend, to consume: It. *spendere*, to spend: L. *dispendērē*, to weigh out—from *dis*, apart; *pendērē*, to weigh]: to lay out, as money; to dispose of; to consume; to waste; to squander; to exhaust; to fatigue; to pass, as time; to exert or exhaust, as force or strength; to be lost or wasted; to be consumed; in *OE.*, to effuse. **SPEND'ING**, imp.: N. act of laying out or expending. **SPENT**, pt. pp. *spēnt*: **ADJ.** consumed; exhausted; deprived of its original force or qualities. **SPEND'ER**, n. *-ēr*, one who spends. **SPEND'THRIFT**, n. *-thrīft*, one who is improvident or reckless in the use of his means. **SPENT BALL**, a ball from a firearm which reaches an object so distant as to be deprived of sufficient force to penetrate it.

SPENER *spā'nēr*. **PHILIPP JAKOB**: illustrious German reformer, founder of the sect known as **PIETISTS** (q.v.): 1635, Jan. 13—1705, Feb. 5; b. Rappoltsweiler (F. Ribeauville), Upper Alsace; son of a legal adviser to Count von Rappoltsweiler. S. early showed deep religious susceptibilities. After studying the classics at Colmar, he entered the Univ. of Strasburg 1651, where the professors Dannhauer and Seb. Schmidt inspired him with a profound love of the Scriptures, not as a heap of dry theological bones, but as a fountain of life and spiritual thought: there he studied especially philology, history, and philosophy. He then became private tutor to the princes of the Palatinate. 1659–62 he visited the Universities of Basel, Tübingen, Freiburg, Geneva, and Lyon. In the following year he became a preacher at Strasburg, where the unction of his sermons exercised a powerful influence on his hearers. At the age of 31, he was transferred to Frankfurt as first pastor; and here, as elsewhere, the profound spiritualism of the man, springing out of a free, simple, *untheological* faith in the Bible, made itself apparent in his preaching and life. Yet S. was the opposite of what is commonly called a *mystic*. The devotion which he sought to excite was not to show itself in transcendental ecstasies, amid which common-sense is apt to swoon away, but in acts of piety, humility, and charity. He had little love for the theology of his times, deeming it liable to develop into a hateful caricature of the free word of life; and he commenced 1670, at his house, meetings for cultivation of evangelical morality—the famous *collegia pietatis*, of great benefit to the German character in those days of stony and barren orthodoxy. He sought to improve the religious instruction given to children. In 1679 a preface which he wrote for a new edition of the *Postille* of Arndt, in which he censured the morals of the upper classes, aroused antagonism; and after a few years he was fain to accept the invitation to become court-preacher at Dresden, and member of the upper consistory. In this capacity he effected important ameliorations in the theological teaching of the Univ. of Leipzig, and in the system of religious

catechising throughout Saxony; but 1689 he fell into disgrace for having addressed a temperate but energetic remonstrance to the Elector Johann Georg III., concerning his personal vices; and being attacked by Carpzow, who coveted his place at court, and by other orthodox theologians, went to Berlin 1691 as provost of the Church of St. Nicholas, and consistorial inspector, offices which he retained to the end of his life. In Berlin he was held in high honor. The Elector of Brandenburg encouraged his efforts after religious reform, and intrusted theological instruction in the new Univ. of Halle (of which S. was practically founder) to Franke, Breithaupt, and other disciples of S. This excited great irritation in the theological faculties of Wittenberg and Leipzig, which (1695) had formally censured as heretical no less than 264 propositions drawn from S.'s writings. S. died at Berlin, leaving a reputation for piety, wisdom, and practical Christian energy which all the excesses of the later pietists have not obscured. Indeed, their errors and extravagancies in no wise characterized him. His chief divergence from the Lutheran faith of that time was his requirement of regeneration as essential for a theologian, and a tendency to literalism in prophetic interpretation. He did not insist that conversion should be a conscious crisis, but only that it is an actual change.—His writings are numerous; the chief are: *Pia Desideria* (Frankf. 1675); *Das geistliche Priesterthum* (Frankf. 1677); *Christliche Leichenpredigten* (13 vols. Frankf. 1677); *Des thätigen Christenthums Nothwendigkeit* (Frankf. 1679); *Klagen über das verdorbene Christenthum* (Frankf. 1684); *Evangelische Glaubenslehre* (Frankf. 1688), and *Theologische Bedenken* (Halle 5 vols. 1700–21). See Hossbach's *Phil. Jak. S. und seine Zeit* (1828, 3d ed. 1861); Wildenhalm's *Phil. Jak. S.* (Leip. 1842–47); Ritschl's *Geschichte des Pietismus* (Bonn 1884); Sachsse's *Ursprung u. Wesen des Pietismus* (Wiesbaden 1884).

SPENSER, *spĕn'sĕr*, EDMUND: poet; one of the chief literary ornaments of the great Elizabethan period about 1552–1599, Jan. 16; b. London. There is no certainty as to his family connection. In 1569 he went to Pembroke Hall, Cambridge, in the humble capacity of sizar. He remained several years, becoming bachelor of arts 1572, master 1576. After leaving college, he went to live with friends in n. England. Of the detail of his life at this period, nothing is known further than that he busied himself with poetry, his first volume of which, *The Shepheard's Calendar*, was published 1579. Its dedication to Sir Philip Sidney was the means of introducing him to that noble and kindly gentleman, who gave him both generous patronage and warm friendship. He seems to have been domesticated with Sir Philip at Leicester House, from which he dates his moiety of the *Four Epistles*, exchanged between him and Gabriel Harvey, printed 1580. Toward the end of this year, through the influence of Sidney's uncle, the Earl of Leicester, an appointment was procured for S. as sec. to Lord Grey of Wilton, queen's

deputy in Ireland, whither he at once proceeded. About this time he began his immortal work, *The Faery Queen*. His official duties must have been punctually performed; as 1586 we find his services rewarded by a grant from the crown of Kilcolman in the county of Cork, an estate of more than 3 000 acres, on which he went to reside. At this time came the evil news to him of the death of his friend Sidney at Zutphen, which he musically bewails in the elegy *Astrophel*. Subsequently, the place of Sidney as patron and friend was in a measure supplied by Sir Walter Raleigh, who visited him in Ireland 1590, took him to England, and introduced him to Queen Elizabeth. His experiences as a suitor for court-favor seem not to have been very pleasant, if we may judge from a passage in one of his works.

The first three books of *The Faery Queen*, issued on his arrival in England 1590, were followed by three more 1591, and a collection of lesser pieces entitled *Complaints*, including *Mother Hubbard's Tale*, *The Tears of the Muses*, etc.; and 1596 by four *Hymns*, so called, in which the Platonic doctrine of Beauty is elaborated in noble music. In 1596 he wrote his *View of the State of Ireland*, a treatise full of sagacious observation, not published till long afterward (Dublin 1633). That the 'gentle poet' should after 14 years' residence in Ireland have framed and published so fierce and relentless a plan for the 'pacification' of that country as he urgently sets forth in this *View*, has caused great wonder. His plan amounted to this—that to the Irish, long turbulent and given to bloody feuds among themselves and risings against the government, there should be offered at once and for all the alternative of submission, or of extermination by sword and fire. This 'cruel' plan he urges as in the long run the most merciful. S.'s plan did not commend itself to the English authorities. In extenuation of it, it should be remembered that the times were brutal and that England was then in a struggle for existence against the great Roman Cath. continental powers.

After about 1591, nearly all record which survives to us of S., further than the dates of his publications, is summed in the facts, that he was married 1594; that he was made sheriff of Cork by the queen 1598; and that in the same year the disaster befell him which shortly preceded and may in part have caused his death. Tyrone's rebellion having broken out, S.'s house at Kilcolman was sacked and burned by the rebels, he and his wife with difficulty escaping while their youngest child perished in the flames. Early the next year he died in London, and, as far as can be inferred from the account given by Ben Jonson to Drummond, in great destitution. He was buried at his own request near Chancer in Westminster Abbey, at the expense of the Earl of Essex; who is said, in the account by Jonson, to have tendered him succor on his death-bed, though too late to be of avail.

S. takes admitted rank as one of the very greatest of English poets, and his chief work, *The Faery Queen*, writ-

ten in that stateliest of English measures since known as the *Spenserian Stanza* (see METER), tedious as it is in its allegory, and in much of its diction obsolete even when written, is a masterpiece of opulent genius. In the poetry of S., an ever-present thirst for and sense of beauty finds fit expression and reflex in a fluent succession of sweet and various cadences; in breadth and splendor of pictorial effect, it has never, perhaps, been surpassed: such lavish exuberance in detail has seldom been so combined with a total impression of chastened and majestic sobriety; and throughout it is pervaded by that atmosphere of moral wisdom and serenity which Milton reverently recognizes in 'the sage and serious Spenser.'—See *Spenser and His Poetry*, by Prof. G. L. Craik (3 vols. 1845). The most complete ed. of the poet's works is by Todd (Lond. 8 vols. 1806); a new ed., with glossary, notes, and life, by Collier, was pub. 1862. Church's short life of S. (1879) is admirable.

SPENSERIAN, a. *spěn-sě'rĭ-ăn*: after the manner or model of *Spenser's* poetry, as in stanzas or measures: see METER.

SPERM, n. *spěrm* [Gr. *sperma*, seed of any kind; *sper'-mātos*, of seed—from *speirō*, I sow]: animal seed; semen; the spawn of fishes. SPERM-CELL, a cell which impregnates, as opposed to a *germ-cell*, which is impregnated. SPERM-OIL, oil obtained from the spermaceti whale, chiefly from the head (see SPERMACETI). SPERMATIC, a. *spěr-măt'ik*, or SPERMAT'ICAL, a. *-ĭ-kāl*, pertaining to or consisting of seed or semen; seminal. SPERMA'TIA, n. plu. *-mā'shĭ-ă*, in *bot.*, motionless spermatozoids in the conceptacles of fungi.

SPERM, n. *spěrm*: contr. from SPERMACETI (q.v.).

SPERMACETI, n. *spěr'mă-sě'tĭ* [L. *sperma cēti*, sperm of the whale: Gr. *sperma*, seed, and L. *cētus*; Gr. *kētos*, any large fish, a whale]: white, brittle, semi-transparent, waxy substance obtained in special cavities of the head of the sperm-whale, *Physeter macrocephalus*: see CACHALOT. It is separated from the oil, in which it is originally dissolved, by boiling water, from which the S. crystallizes as it cools. It is then purified by being remelted in a weak solution of potash, and the impurities skimmed off, and it is finally melted again by the action of steam, and cooled slowly in molds. Its specific gravity is 0.943; it is scarcely unctuous to the touch; does not melt under 100°; has little taste or odor; and occurs in pearly-white, glistening, translucent crystals. S. is an ether compound of cetyl alcohol combined with palmitic acid. It is an emollient and demulcent, hence a useful ingredient in cough-mixtures. Its chief use is external, as an ingredient in various ointments. The *Unguentum Cetacei*, or *Spermaceti Ointment*, of the Pharmacopœia consists of a mixture of S., white wax, and almond-oil. SPERMACETI WHALE, the species of whale from which spermaceti is procured; the sperm-whale; the Cachalot (q.v.).

SPERMAGONES--SPEW.

SPERMAGONES, n. plu. *spér'mă-gōnz* [Gr. *sperma*, seed; *gonos*, offspring]: reproductive bodies in the form of very minute hollow sacs, found on the thallus of lichens; capsules or cysts in lichens and fungi, containing spermatia; also SPERMOGONES.

SPERMARIUM, n. *spér-mă'rî-ŭm* [Gr. *sperma*, seed]: the organ in which spermatozoa are produced.

SPERMATHECA, n. *spér'mă-thē'kă* [Gr. *sperma*, seed; *thekē*, a receptacle]: a receptacle or sac in which ejected semen is stored up, as in some insects.

SPERMATIA, **SPERMATIC**: see under SPERM.

SPERMATOLOGY, n. *spér'mă-tōi'ō-jŭ* [Gr. *sperma*, seed, *spermator*, of seed; *logos*, discourse]: a treatise on sperm, or the fecundating fluid. **SPERMATOPHORA**, n. plu. *-tōf ō-ră*, or **SPERMATOPHORES**, n. plu. *spér-măt'ō-fōrz* [Gr. *phorēō*, I bear]: cases in which bundles of the spermatozoa are packed. **SPERMATOPH'OROUS**, a. *-ō-rŭs*, producing or bearing seed or sperm.

SPERMATOZOIDS, n. plu. *spér'mă-tō-zō'īdz* [Gr. *sperma*, seed; *eidos*, form]: in *anat.*, same as SPERMATOZOA; in *bot.*, moving filaments analogous to the spermatozoa of animals and contained in the antheridia of cryptogams—more commonly called *antherozoids*. **SPERMATOZO'ON**, n. *-tō-zō'ōn*, plu. **SPERMATOZO'A**, *-zō-ă* [Gr. *zōon*, an animal]: in *anat.*, the true fertilizing agents developed in the male generative organs. They appear to be formed from the epithelial lining of the tortuous seminal tubes, of which the organ known as the *testis* is essentially composed. At the period of puberty in man, and at certain periods annually in other animals, the seminal tubes are seen to be filled with cells, from which the spermatozoa are developed. Various changes ensue, and the spermatozoa are finally set free by the bursting of the cell-walls, and arrange themselves in parcels, symmetrically placed, with the so-called heads in one direction, and the tails in the opposite direction. In the human subject, the spermatozoa may be described as clear, hyaloid bodies occurring in the semen, each of which consists of a dilated portion, the head or body, from which a long tail, or filament, issues. The head is flattened from side to side, and of conical form, the pointed extremity being anterior. The length of the spermatozoa is about $\frac{1}{800}$ of an inch. The spermatozoa of different animals vary extremely in size and form. It was formerly supposed that spermatozoa were independent organisms (like the infusoria, e.g.); but it is now known that they must be regarded as epithelial cells (or perhaps nuclei), modified in structure, and endowed with special properties. That the integrity of the spermatozoa is essential for the process of impregnation, is beyond question; but of the nature of the force which they communicate to the ova, we know nothing. See REPRODUCTION IN ANIMALS.

SPERM-WHALE: see CACHALOT.

SPEW, v. *spŭ* [AS. *spiwan*; Dut. *spuuncen*; Ger. *speien*; L. *spuĕrĕ*, to spit]: to vomit; to eject from the stomach. **SPEW'ING**, imp.: N. act of vomiting. **SPEWED**, pp. *spŭd*.

SPEY—SPHÆRENCHYMA.

SPEY, *spā*: river of Scotland, rising in s. Inverness-shire, 6 m. n.w. of Loch Laggan, 10 m. e. of Loch Lochy; flowing n.e. through the counties of Inverness and Elgin, and, after a course of about 110 m., falling into the Moray Firth, three m. w. of Port-Gordon. During a portion of its lower course, it is the boundary between the counties of Elgin and Banff. In length, it is the second river of Scotland; but except for its very profitable salmon-fisheries, it is of little value; and it is not picturesque. It has the swiftest current of all the large rivers in Britain, and is subject to sudden and violent freshets, resulting at times in disastrous inundations.

SPEZIA, *spā'dzē-ā*: city of n. Italy, province of Genoa, 60 m. s.e. of the city of Genoa, near the inner point of the Gulf of Genoa. It is the principal naval station and arsenal of the kingdom of Italy. The Gulf of S., anciently Gulf of Luna, is formed by the bifurcation of a spur of the Apennines, and is $3\frac{1}{2}$ m. long, and 3 m. broad; its w. shore is indented by many coves or creeks, five of which—Porto-Venere, La Castagna, the Varignano (the quarantine station), Grazie, and Panigaglia—are so deep that large men-of-war may be moored in them. A breakwater stretches across the gulf from Point Santa Maria to Point Santa Teresa—7,220 ft. The arsenal is in size about 4,000 by 2,400 ft. The place is strongly fortified. The shipping and commerce of S. are considerable. The scenery of the gulf is beautiful, and the mildness of its climate was famous in ancient times. The soil produces olives, excellent wines, fruits, etc.; and the town is a much-frequented watering-place. There are numerous foreign consulates. Steamers perform the voyage from S. to Genoa in eight hours. S. is on the Genoa and Pisa r.r.—Pop. (1891) 19,564.

SPEZZIA, *spēt'sē-ā* (anc. *Pityussa*, or, according to some scholars, anc. *Haliassa*): small Greek island at the entrance to the Gulf of Nauplia. The island is unfruitful, and its people are engaged chiefly in commercial pursuits. The town of S., on the n. coast, has more than 6,500 inhabitants.—Pop. of island, 12,000.

SPHACELATE, v. *sfūs'ē-lāt* [Gr. *sphak'ēlōs*, mortification, gangrene]: to affect with gangrene; to mortify; to decay and become carious, as a bone. **SPHAC'ELATING**, imp. **SPHAC'ELATED**, pp.: **ADJ.** affected with gangrene; mortified. **SPHAC'ELA'TION**, n. *-lā'shŭn*, the process of becoming gangrenous; mortification. **SPHAC'ELUS**, n. *-lŭs*, in *med.*, complete mortification, as distinguished from gangrene, the incomplete state.

SPHÆRAPHIDES, n. plu. *sfē-rāf'ī-dēz* [Gr. *sphaira*, a globe; *rhaphis*, a needle; *rhaphidōs*, of a needle]: in *bot.*, globular clusters of raphides, or globular aggregations of minute crystals, as found in phanerogamous plants.

SPHÆRENCHYMA, n. *sfē-rēng'kī mǎ* [Gr. *sphaira*, a sphere or globe; *engchuma*, the substance of organs, an infusion—from *en*, in; *cheō*, I pour]: in *bot.*, vegetable tissue composed of spherical cells.

SPHÆROSIDERITE—SPHAGNUM.

SPHÆROSIDERITE, n. *sfērō-sīd'ēr-īt* [Gr. *sphaira*, a sphere; *sidēros*, iron]: a term applied to grape-like or kidney shaped concretions of sparry carbonate of iron.

SPHÆRULARIA, *sphēr ū-lā'rī-a* [L.—from *sphærua*, dim. of *sphæra*, sphere]: remarkable nematode, or round worm, a parasite in various species of bees. The female is almost an inch in length, has nearly uniform diameter of $\frac{1}{15}$ of an inch, is of whitish color, is bluntly pointed at each end, and is covered with numerous (about 800) small button-like projections—a peculiarity to which it owes its name. There is neither mouth, œsophagus, intestine, nor anus; and the whole animal consists of little more than an elongated mass of fatty tissue and reproductive organs, which in full-grown individuals contain ova in various stages of development. Although the female was discovered 1836 (by Leon Dufour), it was not until 1861 that the discovery of the male was announced by Lubbock in his memoir on this parasite. The male had been overlooked because it is more than 28,000 times smaller than the female: it is frequently found sexually united to the female, as occurs in *Sclerostoma syngamus* (q.v.), the parasite which gives rise to the *Gapes* in various birds.

SPHÆRULITES, n. plu. *sfēr ū-līts* [Gr. *sphaira*, a sphere; *lithos*, a stone]: in *geol.*, a cretaceous genus of thick subconical shells, having opercular-looking upper valves; a variety of obsidian or pearl-stone, found in small rounded grains.

SPHAGNUM, n. *sfäg'nŭm* [Gr. *sphagnos*, a kind of moss]: kind of moss found in bogs. **SPHAGNOUS**, a. *sfäg'nŭs* mossy; pert. to bog-moss called sphagnum.—*Sphagnum* is a genus of mosses, whose spore-case is an urn closed by a deciduous lid, its brim toothless, the calyptra irregularly torn. The species are very numerous, and are distributed throughout the temperate latitudes, being very common in bogs—hence their popular name, *Bog-moss*. There are about 25 N. Amer. species. All the members of the genus are very elegant plants. They often grow in considerable masses, absorbing water like a sponge, but becoming friable when dry. They contribute much to the formation of peat. Gardeners employ them in preference to other mosses for covering and keeping moist the roots of plants, as they have in a high degree the property of absorbing moisture from the atmosphere. They have been used as food in barbarous countries, but are very slightly nutritive. The cells of the leaves are remarkable for their spiral structure, and for large pores in their sides. Sphagnum continues to grow at the top while at a certain depth below its life ceases; and thus it gradually fills up the depression of pools and swamps, retaining earthy matter and building up arable levels.



Sphagnum.

SPHALEROCARPIUM—SPHENOID,

SPHALEROCARPIUM, n. *sfāl'ēr-ō-kār'pī um* [Gr. *sphalēros*, unsteady, faithless—from *sphallō*, I trip up; *karpos* fruit]: in *bot.*, a small indehiscent, one-seeded fruit. inclosed within a fleshy complex pericarp.

SPHEGIDÆ, *sfē'jī-dē*, or **SPHECIDÆ**, *sfē'sī-dē* [Gr. *sphex*, wasp, and *-idæ*]: family of fossorial nymenopterous insects, winged in both sexes, much resembling bees or wasps in appearance. They are solitary in their habits. Many burrow in sand, and are known as *Sand-wasps*, or *Digger-wasps*. They are extremely active and restless, and may be seen running about on sand-hills, with wings in constant motion. Some carry spiders, and others caterpillars, into their burrows, as food for their larvæ, placing them there when the egg is laid, and stinging them, thus rendering them torpid without killing them. They show wonderful energy and perseverance in dragging the spider or caterpillar to the burrow. They are mostly tropical insects. Of the genus *Sphex*, about 12 species are found in the United States.

SPHENE, n. *sfēn* [F. *sphène*—from Gr. *sphēn*, a wedge]: a mineral composed of silica, titanitic acid, and lime.

SPHENIS'CIDÆ: see PENGUIN: AUK.

SPHENO-, prefix, *sfēn-o* [Gr. *sphēn*, *sphēnos*, a wedge]: pertaining to or resembling a wedge in shape.

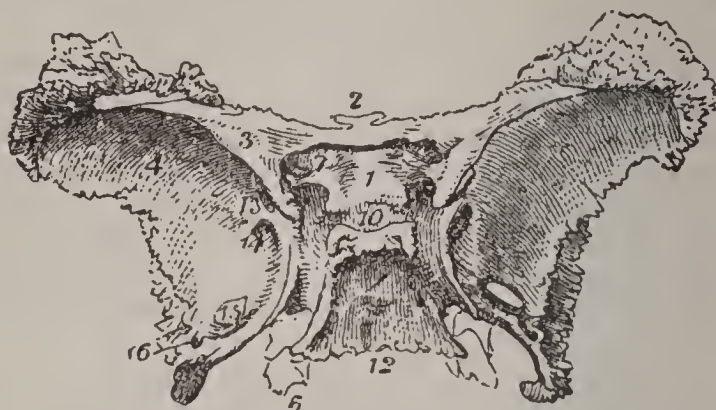
SPHENOCEPHALUS, n. *sfēn'ō-sēf'ă-lūs* [Gr. *sphēn*, a wedge; *kephālē*, the head]: in *anat.*, a malformation of the head by which the upper part of the cranium takes a wedge-like appearance.

SPHENOGRAM, n. *sfēn'o-grām* [prefix *spheno-*; Gr. *gramma*, a writing, a letter]: a cuneiform or arrow-headed character (see CUNEIFORM). **SPHENOGRAPHER**, n. *sfēn-ōg'ra-fēr*, one who is skilled in sphenography, or the deciphering of cuneiform inscriptions. **SPHENOGRAPHY**, n. *-fī* [prefix *spheno-*; Gr. *graphō*, I write]: act or art of writing in cuneiform or arrow-shaped letters or characters; the art of deciphering cuneiform writings.

SPHENOID, a. *sfē'nōyd*, or **SPHENOIDAL**, a. *sfē-nōyd'āl* [Gr. *sphēn*, a wedge, *sphēnos*, of a wedge; *eidos*, likeness: F. *sphénoïde*]: wedge-like, as applied to a bone of the skull which wedges in and locks together most of the other bones. *Sphenoid*, often contracted into **SPHENO**, *sfē'nō*, signifies, belonging both to the sphenoid bone and to the part indicated by the other constituent of the compound, as *spheno-maxillary*. The *Sphenoid Bone* is at the anterior part of the base of the skull, and articulated with all the other cranial bones, which it wedges firmly together. It somewhat resembles a bat with wings extended, hence was termed the *Os respertilionis*. It is divisible into a body, the greater and lesser wings, and various processes. The greater wings present three surfaces: a superior or cerebral surface, forming part of the floor on which the brain rests; an anterior surface, which assists to form the outer part of the orbit of the eye; and an external surface with a rough ridge, giving attachment to the external

SPHERE.

pterygoid muscle, one of the most powerful muscles of mastication. The 2d, 3d, 4th, 5th, and 6th cranial nerves emerge from the cranial cavity through foramina in this bone. Although considered in human anatomy as a single bone, it may be regarded as composed of several bones, which, after a time, unite with one another, as the basisphenoid, the pre-sphenoid, the ali-sphenoid, and the orbito-sphenoid bones: see SKULL.



The Upper or Cerebral Surface of the Sphenoid Bone:

- 1, The olivary process; 2, the ethmoidal spine; 3 and 4, the lesser and greater wings on the left side; 6, the extremity of left pterygoid process; 7, the foramen for the optic nerve; 10, the sella turcica on which the pituitary gland rests; 12, the basilar portion of the bone, joining with the occipital; 13, part of the sphenoidal fissure which separates the greater from the lesser wings, and transmits the 3d, 4th, the ophthalmic division of the 5th, and the 6th nerves, with the ophthalmic vein; 14, the foramen rotundum, transmitting the second division of the 5th nerve; 15, the foramen ovale, transmitting the third division of the 5th nerve; 16, the foramen sphenosum for the passage of the middle meningeal artery.

SPHERE, n. *sfēr* [F. *sphère*—from L. *sphæra*; Gr. *sphaira*, a ball, a globe: comp. Gael. *speur*, the sky]: the vast concave or expanse of the heavens; a globe; a celestial orb; a circle: in *geom.*, round solid figure (see below): any round or approximately round solid body: employment; rank; circuit of action; knowledge or influence: V. in *OE.*, to place in a sphere; to form into roundness. **SPHERICAL**, a. *sfēr'ī-kāl*, round; globular; relating to a sphere. **SPHER'ICALLY**, ad. *-lī*. **SPHER'ICALNESS**, n. *-nēs*, or **SPHERICITY**, n. *sfēr'īs'ī-tī*, state or quality of being round; roundness. **SPHERICLE**, n. *sfēr'ī-kl*. or **SPHERULE**, n. *sfēr'ūl*, a little sphere. **SPHER'ICS**, n. plu. *-īks*, doctrine of the properties of the sphere as a geometrical body, in relation to the different circles, lines, angles, etc., which may be described on its surface. **SPHERY**, a. *sfēr'ī*, in *OE.*, spherical; round; belonging to the spheres. **SPHERICAL ANGLE**, in *trig.*, angle formed by the intersection of two great circles on the surface of a sphere or spheroid. **SPHERICAL GEOMETRY**, branch of geometry that treats of spherical bodies and their various properties. **SPHERICAL TRIGONOMETRY**, branch of trigonometry which treats of spherical angles and triangles. **MUSIC OF THE SPHERES**, in *anc. astron.*, music imagined to result from or to attend the rhythmic motions of the spheres.—**SYN.** of 'sphere, n. globe; globule; orb; ball.

SPHERE—SPHEROGRAPH.

SPHERE, in Geometry: regular solid figure, every point of whose surface is equally distant from its centre; and whose outline is traced by a circle revolving round its diameter. All sections of a S. by a plane are necessarily circles, and all sections by planes passing through the centre, or by planes cutting the S. at equal distances from the centre, are equal. The former sections are called *great*, the latter *small, circles*. Small circles may vary in size between a mere point and a great circle, approaching either limit however nearly. The surface of a S. is equal to that of four of its great circles, or (taking x for the radius of the S.) to $4\pi x^2$; and its volume to that of a cone whose altitude is twice that of the S., or $4x$, and whose base is a great circle of the S., the formula for it being $\frac{4x}{3} \times \pi x^2$, or $\frac{4}{3} \pi x^3$. The most remarkable geometrical property of the S. is the relation which its surface and volume bear to those of the 'circumscribing' cylinder, i.e., a cylinder whose length and diameter of each end are each equal to the diameter of the S., and in which, therefore, the S. will be exactly contained. The concave surface of such a cylinder is exactly equal to the surface of the S.; and not only so, but if a section parallel to the base of the cylinder be made through both cylinder and S., the curved surfaces of the portions cut off are equal, whether such portion be cut off from one end or be intercepted between two parallel sections: it follows from this that the curved surface of any section of a S. with parallel ends is equal to the product of the circumference of a great circle of the S. by the height or thickness of the section, and that the curved surfaces of all sections of a S. are proportional to the thickness of such sections. The volume of the S., also, is equal to two-thirds of that of the circumscribing cylinder.

SPHEROGRAPH, n. *sfēr'ō-grāf* [Gr. *sphaira*, a sphere; *graphō*, I write]: simple and efficient instrument for mechanical solution of problems in spherical trigonometry presented by navigation, geography, etc., invented 1856 by Stephen Martin Saxby, of the Brit. navy. It consists of two circular pieces of paper, the whole of the under and the rim of the upper being of stout card-board, and the interior portion of the upper one of strong transparent tracing-paper; these two circles are attached by a pin through their common centre, the pin being made to work in an ivory collar, to prevent any lateral motion of either circle. Round the pin as centre, equal circles are drawn, one on each sheet; each circle is then filled in with lines representing meridians and parallels according to the stereographic projection; and the instrument is complete. As one of the chief uses of the S. is to show the course, distance, and differences of latitude and longitude in 'Great Circle Sailing' (q.v.), we give a problem of this sort in illustration of the working of the instrument. Fig. 1 represents the appearance presented by the S. when the two poles are separated from each other by an angular

SPHEROGRAPH.

distance of 40° ; the lines drawn on the under circle (represented by *dotted lines* in the fig.) showing through the

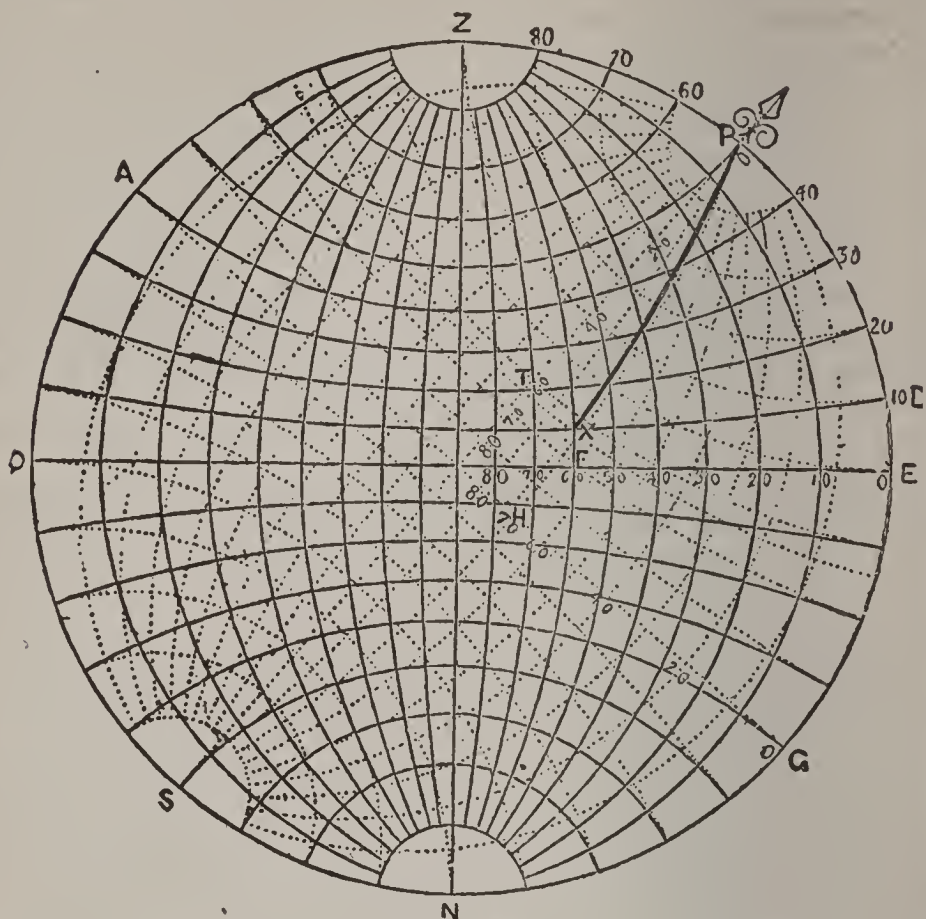


Fig. 1.

transparent paper which forms the upper circle, on which the continuous lines are delineated. Suppose, then, that a ship is in lat. 50° n., long. 20° w., and is bound for a point in lat. 10° n. and long. 80° w.; and that its great circle track, etc., are required: let P, the pole of the under circle, represent the place of the ship (the circle ZPD always representing the meridian of the point of departure, and the upper circle, whose pole is Z, representing the earth's hemisphere), which is done by turning the upper circle till P appears at lat. 50° n.; X represents the point to be arrived at, consequently PX, the arc of a great circle passing through P and X, is the great circle track, PD is the difference of lat., EF the difference of long.; the spherical angle XPD, measured by GH, an arc of a great circle, of which P is the pole, is the course; and the length of PX is measured by PT, the portion of PS which is cut off by a parallel of the under circle through X, in degrees. The data, then, being as above, we find by inspection of the instrument the difference of lat. = 40° s., the difference of long. = 60° w., the course = s. $72\frac{3}{4}^\circ$ w., and the distance = $63\frac{1}{8}^\circ$ = 3,800 nautical m. Besides saving of time and labor by the use of this instrument—the whole work being the *setting* of the instrument, and then the reading off of the required elements—it is evident that the substitution of a mechanical solution for calculation greatly lessens the probability of error. It is found that spherographs of 5

SPHEROID.

inches radius give results of sufficient accuracy for all purposes of the navigator.

All other spherical problems can be solved with equal facility by this instrument; but one more example will suffice. Let Z (fig. 2) now represent the zenith of a place,

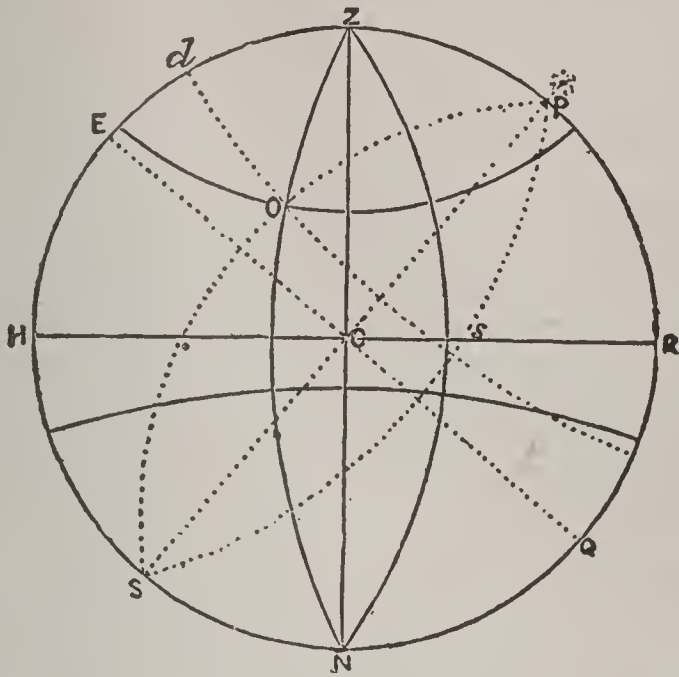


Fig. 2.

ZHNR its meridian, P the n. pole of the heavens; the other lines are then circles of declination, altitude, azimuth, and hour circles; and let O represent the place of the sun in given declination and altitude at a certain time. The instrument is now set by turning round the upper card till the point O (determined by its circle of declination and hour circle) on the under card falls upon the circle of given altitude on the upper card; then d is the sun's place at noon, Hd being his meridian altitude, PR the latitude of the place, the angle RPS (measured in degrees along QE) the time of sunset, ds half the length of the day, sc half the length of the night, etc. The spherograph is useful also in finding latitude when the horizon is hid by fogs, right ascensions at night, and correcting lunar observations; but for these purposes, spherographs are specially constructed, as some slight variations in the form given above are necessary.

SPHEROID, n. *sfēr'oyd* [Gr. *sphaira*, a sphere; *eidos*, resemblance]: round body or figure not perfectly spherical; a solid generated by the revolution of an ellipse about one of its axes (see below). SPHEROIDAL, a. *sfēr-oyd'āl*, having the form of a spheroid (see SPHEROIDAL CONDITION). SPHEROID'ALLY, ad. *-lī*. SPHER'OIDIC'ITY, n. *-oy-dīs'ī-tī*, state or quality of being spheroidal. OBLATE SPHEROID: see under OBLATE 1.

SPHEROID—SPHEROIDAL CONDITION.

SPHEROID: species of Ellipsoid (q.v.), and represented by the same equation. If an ellipse be made to revolve round one of its axes, the curved outline of the ellipse describes the S. Should the major or longer axis be the axis of revolution, the S. is said to be *prolate* (Lat. *prolatus*, lengthened); but if the minor or shorter axis, *oblate*. As the earth's axis of revolution, which runs from pole to pole, is about 25 m. shorter than the longest or equatorial diameter, and as these diameters are at right angles to each other, the earth is considered an oblate spheroid.

SPHEROID'AL CONDITION of Liquids: state assumed by liquids when placed on a highly heated surface. The singular phenomena presented by liquids in this condition were discovered by Leidenfrost, but carefully investigated first by Boutigny. Indeed, one, at least, of these phenomena has been popularly known for a very long time, being the foundation of the rough practical method of determining whether or not a flat-iron is so hot as to be likely to singe the linen to which it is to be applied. The test consists simply in letting a drop of water fall upon the iron: if it be not too hot, the drop spreads over the surface and evaporates: if it be too hot, the drop at once glances off the iron without wetting it.

The common experimental method of exhibiting the S. C. is easily performed thus: A metallic disk, slightly concave, like a watch-glass, is heated by a lamp, and water is cautiously dropped on it from a pipette. If this be done before the disk is sufficiently heated, the water boils almost explosively, and is dispersed at once in vapor. But when the disk is hot enough, the water remains suspended, as shown in the cut, *above* the surface; and the drop, when small, takes nearly the form of an oblate spheroid. Various proofs have been given, though they are obviously unnecessary, that there is no contact in this case. Thus, if the disk be very nearly flat, light passes freely between it and the drop. Again, if one pole of a galvanic battery be connected with the disk, and the other be dipped into the drop, a galvanometer interposed in the circuit shows that no current passes. By heating the disk sufficiently, and dropping on the water very carefully, we may easily keep in the spheroidal state as much water as, if not more than, the disk could hold when cold. The explanation of the phenomenon is not yet clear; but there is no doubt that the radiant heat from the disk raises vapor so freely from the surface of the drop nearest it as to interpose a cushion of dense and highly-heated vapor between them, on which the drop, as it were, floats; the pressure of the vapor balancing its weight. This is not, however, a quite complete explanation of the experiment, and it would require too much detail to examine it more closely. But the most curious fact connected with the experiment is, that the water does *not* boil. In fact, it evaporates so freely that the heat carried off from it, as latent heat, by the vapor which is constantly



SPHEROIDAL CONDITION.

formed, keeps its temperature somewhere about 206° F. only. This suggests a curious experiment, which is found to succeed: *Boiling* water, dropped on a red-hot plate of metal, instantly assumes the spheroidal state, and is *cooled* six degrees below boiling. It is not necessary that a metal plate be used—a watch-glass will suffice for the experiment; but *hot* water must be dropped on it, or the glass will crack.

Other liquids, and even some bodies solid at ordinary temperatures, can be easily brought into the S. C.—the lowest requisite temperature of the disk being dependent on the boiling-point of the substance. Thus, while water has a temperature of 206° F. in the S. C., the disk must have a temperature of 340° F. at least—for alcohol, these temperatures are 168° F. and 270° F.—for ether, 94° F. and 140° F. A good example of a solid entering this state is furnished by dropping crystals of iodine on a hot platinum disk. It is not necessary that the disk be solid; it is easy to obtain ether, and even water, in the S. C. over the surface of hot oil—but great care is required, as explosions are apt to occur, in which case the hot oil is freely thrown about.

Many cases of bursting of steam-boilers, otherwise apparently inexplicable, seem attributable to this condition of matter. Thus, if the water-supply has run low, and the boiler has been overheated, it is conceivable that the contents may sometimes be in the S. C. The addition of cold water, in such a case, would bring them suddenly *in contact with* the overheated metal, and the large quantities of steam thus violently generated might burst the boiler.

A very singular experiment, the freezing of water on a red-hot plate, is easily performed by the help of this property of matter. Liquid sulphurous acid is so volatile as to have a temperature of 13° F. only, when in the S. C. As this is 19° under the freezing-point of water, if a little water be dropped into the spheroid of acid it is at once frozen, and the pellet of ice can be dropped on the hand from the still red-hot plate. Even mercury can be frozen by a similar process; but as much greater cold is required, the substance in the S. C. is a mixture of solid carbonic acid and ether.

The hand may be dipped for a very short time with impunity into melted lead, and even into melted copper. The vapor, instantly raised from the moisture of the skin, prevents, so long as that moisture lasts, more than an endurable amount of radiant heat from reaching the hand; also it prevents direct contact. It is probable that a knowledge of some forms of this phenomenon, in old days, was employed by priestcraft for protecting, when desirable, the victims of the Ordeal (q.v.) by fire. The phenomenon may easily be reversed. Thus, a red-hot silver ball dropped into a vessel of water is seen to glow for some time, till it has so far cooled that the water comes into contact with it, when we have, as in the other form of the experiment, an immediate and violent formation of vapor. The success of this experiment is greatly aided by addition of some strong ammonia to the water.

SPHEROMETER—SPHINX.

SPHEROMETER, n. *sfēr-ôm'é-tēr* [Gr. *sphaira*, a sphere; *metron*, a measure]: instrument for measuring the radii of a sphere. It consists of a 3-armed frame standing on 3 steel pins exactly equidistant and of exactly equal height, with vertical screw (ending in a point below) working in a socket at the intersection of the 3 arms. At one side is a fixed scale, and the large head of the screw is graduated on the rim. By the aid of this graduation and the fixed scale, it is possible to determine with precision the distance between the extremity of the screw and the plane passing through the contact-points of the steel pins with the spherical surface under examination. And as the distance between the pins is known, the radius may be easily calculated. The S. is employed by opticians in determining the focal lengths, etc., of lenses.

SPHEROSIDERITE: see SPHÆROSIDERITE.

SPHERULITES: see SPHÆRULITES.

SPHINCTER, n. *sfīngk'tēr* [Gr. *sphīngktēr*, that binds tightly or contracts—from *sphīnggō*, I bind tight]: in *anat.*, a muscle that contracts or shuts an orifice or opening which it surrounds. Sphincter Muscles are circular bands of muscular fibres, whose function is to antagonize the expellent action of certain viscera, especially the bladder and the lower part of the rectum. It is to the presence of these muscles that the higher animals owe the power of retaining for a considerable period the excrementitious matters collected in the bladder and rectum, and of discharging them at intervals, the S. muscles being, like those engaged in the process of respiration, mainly, though not entirely, under control of the will. Under certain conditions the necessity for expelling the contents of these viscera becomes so urgent that the sphincters lose their ordinary voluntary power.

SPHINX, n. *sfīngks* [L. *sphīnx*; Gr. *sphīngx*, the sphinx, the throttler—from Gr. *sphīnggō*, I bind tight]: in anc. myth., a fabulous and terrible monster, mentioned first in Hesiod; described as having a lion's body, woman's head, bird's wings, and serpent's tail—ideas which originated probably in Phœnicia, which had adopted this symbolical form into the mythology from Egypt. She was fabled to be the issue of Orthos the two-headed dog of Geryon, by Chimæra (see CHIMERA); or of Typhon (q.v.) and Echidna. This was the *Sphinx of Thebes* in Bœotia, said to have been sent into the vicinity of Thebes by Juno, to punish the transgression of Laius; or according to other accounts, sent by Bacchus, Mars, or Pluto: see ŒDIPUS. She was said to propound riddles to travellers, and tear to pieces those who could not solve them. Thence the term S. came to have its modern application to one who talks in enigmas.—S. is also the generic name of the hawk-moths, so called because the attitude of the caterpillar resembles that of the Egyptian S. (see HAWK-MOTH.)

Sphinx in general is the name given to a compound creature of Egyptian and Greek art and mythology. The

SPHINX.

Sphinxes have the body of a lion, a human or an animal head, and two wings attached to the sides. Various other combinations of animal forms have been called by this name, though they are rather griffins or chimeras. Human-headed Sphinxes have been called androsphinxes; one with the head of a ram, a criosphinx; with a hawk's head, a hieracosphinx. The form, when complete, had wings added at the sides; but these are of a later period, and seem to have originated with the Babylonians or Assyrians. In the Egyptian hieroglyphs, the S. bears the name *Neb*, or Lord, and *Akar*, or Intelligence; corresponding to the account of Clemens, that these emblematic figures symbolized intellect and force. The notion that they allegorized the overflow of the Nile when the sun was in the constellations Leo and Virgo, appears unfounded. In Egypt, the S. appears also as the symbolical form of the monarch considered as a conqueror, the head of the reigning king being placed on a lion's body,



Greek Sphinx, from a sculpture in British Museum.



Egyptian Sphinx, Louvre Museum.

mid. It is sculptured out of a spur of the rock, to which masonry has been added in certain places, to complete the form; and measures 172 ft. 6 in. long by 56 ft. high. Immediately in front of the breast, Caviglia found, 1816, a small naos, or chapel, formed of three hieroglyphical tablets, dedicated by the monarchs Thothmes III. and Rameses II. to the S., whom they adore under the name Hor-em-akhu, i.e., 'Horus in the Horizon.' These tablets formed three walls of the chapel; the fourth wall in front, had a door in the centre, and two lions couchant upon it. A small lion was found on the pavement, and an altar between its fore-paws, apparently for sacrifices offered to it in the time of the Romans. Before the altar was a paved esplanade or dromos, leading to a staircase of 30 steps placed between two walls, and repaired in the reigns of M. Aurelius and L. Verus, 166, May 10. In the reign of

the face bearded, and the usual dress-drapery being suspended before it. Thus used, the S. was usually male; but in the case of female rulers, the figure has a female head, and the body of a lioness.

The most remarkable S. is the Great S. at Gizeli, a colossal form, hewn out of the natural rock, 300 ft.

e. of the second pyra-

SPHINX.

Severus and his sons, 199-200, another dromos, in the same line as the first, and a diverging staircase, were made; and some additions were found to have been made to the parts between the two staircases in the reign of Nero. Votive inscriptions of the Roman period, some as late as the 3d c., were discovered in the walls and constructions. On the second digit of the left claw of the S. was discovered an inscription, in pentameter Greek verses, by Arrian, probably of the time of Severus. Another metrical and prosaic inscription was found. In addition to these walls of unburnt brick, galleries and shafts were found in the rear of the S., extending northward. The excavations, however, of Mariette-Bey, 1852, have thrown further light on the S., discovering the peribolos, or outer



View of the Great Sphinx during the excavations of Caviglia, 1816.
From Colonel Vyse's *Pyramids of Gizeh*.

wall that encircled it; discovering that the head only was sculptured; and that the sand which had accumulated round it was brought by the hands of man, and not an encroachment of the desert; also that the masonry of the belly was supported by a kind of abutment. South of the S. Mariette found a dromos which led to a temple of the time of the fourth dynasty, of huge blocks of alabaster and red granite. In the midst of the great chamber of this temple were found seven statues, five mutilated and two entire, of the monarch Shaf-ra or Cephren, of a porphyritic granite: they are fine examples of ancient Egyptian art. While the beauty and grandeur of the Great S. have often attracted the admiration of travellers, its age has always been a subject of doubt; but these later discoveries prove it a monument of the age of the 4th dynasty, or contemporary with the Pyramids (q.v.).

SPHRAGISTICS—SPHYGMOGRAPH.

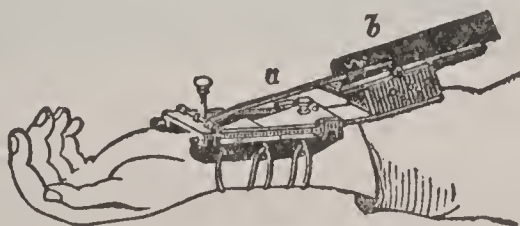
Besides the Great S., avenues of Sphinxes have been discovered at Saqqarah, forming a dromos to the Serapeium of Memphis; and another dromos of the same at the Wady Esseboua. A S. of the age of the Shepherd dynasty has been found at Tanis, another of the same age is in the Louvre; and a granite S., found behind the vocal Memnon, and inscribed with the name of Amenophis III., is at St. Petersburg. An avenue of criosphinxes has been found at Karnak; each figure is about 17 ft. long, and of the age of Horus, one of the last monarchs of the 18th dynasty. Several small Sphinxes are in various European collections, but none of very great antiquity.—There were other colossal S. figures in Grecian lands, all having women's heads. One of these Sphinxes stood on the sacred road near Miletus in Ionia; another in the temple at Assus. Small figures of Sphinxes have been found at Curium in Cyprus, Mycenæ, Camirus in Rhodes, and elsewhere.—The S. was a favorite subject of ancient art; appearing in bas-reliefs, on medals of Chios and other towns, and often as the decoration of arms and furniture. In Assyria and Babylonia, representations of Sphinxes have been found, and they are frequent on Phœnician works of art.

Birch, *Mus. of Classic. Antiquit.*, II. 27; *Quart. Rev.*, XIX. 412; Vyse, *Pyramids*, III. 107; Young, *Hieroglyphicks*, pl. 80; Letronne, *Inser. Grecq.*, II. 460; *Rev. Arch.*, 1853, p. 715; 1860, p. 20; *Schol. Euripid.*, I. 1, 1134; Hesiod, *Theog.*, 326; Creuzer, *Symbolik*, I. 495; Millin, *Gal. Myth.*, 502, 505; Cesnola, *Cyprus*, p. 110 *seq.*, 263 *seq.*; Schliemann, *Mycenæ*, pp. xiv., 184.

SPHRAGISTICS, n. *sfřä-jřis'třks* [Gr. *sphragis'třkos*, of or for sealing—from *sphragis*, a seal]: the science of seals, their history, peculiarities, and distinctions, in relation to documents.

SPHRIGOSIS, n. *sfřř-gř'sřs* [Gr. *sphrigaō*, I am vigorous]: in *bot.*, the disease of over-rankness, either constitutional or the effect of abundant nutriment, from which many members of the vegetable kingdom suffer.

SPHYGMIC, a. *sfřg'mřk* [Gr. *sphugmōs*, the pulse]: of or pertaining to the pulse. **SPHYG'MOGRAPH**, n. *-mō-grăřf* [Gr. *graphō*, I describe]: contrivance for indicating the character of the pulse (see below). **SPHYG'MOGRAPH'IC**, a. *-grăřf'řk*, connected with or relating to a sphygmograph. **SPHYGMOMETER**, n. *sfřg-mřm'ě-těr* [Gr. *metron*, a measure]: instrument for rendering visible arterial pulsations, or for counting them; a sphygmograph.



Marey's Sphygmograph.

SPHYGMOGRAPH, *sfřg'mō-graf*: instrument for ascertainment and permanent record of the form, force, and

SPHYGMOGRAPH.

frequency of the pulse-beat, and the changes which that beat undergoes in certain morbid states. This instrument consists of two essential parts: the first part comprises two levers, one of which is so delicately adjusted on the vessel whose pulsation is to be examined, that on each expansion of the vessel the lever undergoes a corresponding slight elevation: this lever communicates by a perpendicular arm with a second, to which it transmits the impulse received from the vessel; the extremity of this second lever is armed with a pen-point, which records the movements thus indicated on a movable plate, controlled by the second part of the instrument. The second part consists of a plate, moved by watch-work, and bearing a strip of paper on which the *sphygmographic* tracery is formed.

Mode in which the Tracery is formed.—As the pulse transmits through the levers a vertical movement to the pen-point, and the plate, on which the tracery is formed, is moved steadily across the pen-point, and undulating line (fig. 1) is the result: the *height* of the elevations indicating the strength of the pulse; and the *number* of the elevations delineated in the time the pen takes to travel, its frequency.

Figs. 1, 2, and 3 are fac-similes of sphygmographic tracings: of these, fig. 1 is the tracing presented by a natural pulse; figs. 2 and 3 are morbid. The latter are excellent examples of the tracings produced by the pulse at



Fig. 1:

the wrist in two common forms of cardiac disease, and exhibit the manner in which the tracing is modified in diseased states of the circulatory system. Fig. 2 represents the pulse of a patient suffering from an incompetent state of the valves guarding the orifice of the aorta, the great vessel conveying blood from the heart. The blood, in such a case, when propelled into the aorta, distends it, and communicates a pulse throughout the arterial system. When



Fig. 2.

the vessel again contracts, regurgitation takes place into the cavity of the heart, as the valves, which should prevent this regurgitation, and maintain the artificial tension, are unable to perform their function. The pulse-beat is accordingly abrupt, and of short duration, and the sphyg-

SPHYRÆNIDÆ—SPICCATO.

mographic tracing presents a series of abrupt elevations and depressions. Fig. 3 represents the pulse in a different

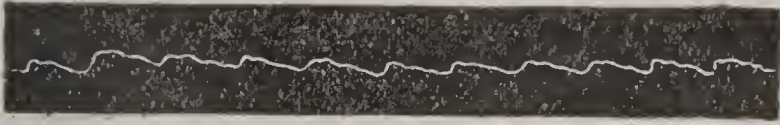


Fig. 3.

form of cardiac disease, in which the valves are so affected as to obstruct the passage of the blood into the circulation: the effect of this on the pulse is to render its beats weakly marked and irregular, and in the sphygmographic tracing, the elevations are diminished in height and regularity. The pulse, in extreme forms of this lesion, is represented in sphygmographic tracing by a slightly waving line.

SPHYRÆNIDÆ, *sfī-rēn'ī-dē* [from *sphyræna*, hammer-fish: Gr. *sphyra*, hammer]: family of fishes included by Cuvier in *Percidæ*, but having the ventral fins far behind the pectorals, and the bones of the pelvis quite detached from those of the shoulder. The form is elongated; there are two dorsal fins; scales are small and cycloid; mouth is very large, with strong sharp teeth. The species are found in tropical seas, and sometimes in higher latitudes, as off the New England coast. Some attain large size: e.g., the BARRACOUA, or Barracouda Pike (*Sphyræna picuda*), inhabitant of tropical parts of the Atlantic; it is scarcely less formidable than the White Shark. It is somewhat esteemed as food, but at some seasons of the year becomes unwholesome. It is a beautiful fish, of rich green color above, and white beneath. The BECUNA (*S. vulgaris*) also is valued as food; and its scales and air-bladder yield a substance used for making artificial pearls. *S. argentea* of the Pacific coast, 3 ft., is also edible.

SPIAL, n. *spī'āl* [see SPY]: in *OE.*, a spy; a scout.

SPICA, n. *spī'ka* [L., an ear of corn]: in *surg.*, a form of bandage resembling a spike of barley. The turns of the bandage cross like the letter V each leaving a portion uncovered.

SPICATE, a. *spī'kāt* [L. *spicātus*, furnished with spikes — from *spīca*, an ear of corn, a spike]: in *bot.*, having the form of a spike or ear of corn; arranged in a spike.

SPICCATO, *spīk-kā'tō* [Ital. separated]: musical term, indicative, like *Staccato* (q.v.), of a distinct and detached mode of performance. Its usual application is to music for bowed instruments, implying that each note is to have a bow distinct from that which precedes or follows it.

SPICE—SPICULA.

SPICE, n. *spīs* [F. *épices*; It. *spezie*, spices: OF. *espice*, spice—from L. *speciēs*, a kind: in mid. L. *speciēs*, a spice, drug]: aromatic vegetable substance for seasoning food (see below): a thing that imparts pungency or flavor to food; a small quantity giving a flavor to a greater: V. to season or flavor with spice; to render agreeable to the palate; to tincture. **SPICING**, imp. **SPICED**, pp. *spīst*: **ADJ.** seasoned with spice; having an agreeable taste or flavor. **SPICER**, n. *-sēr*, one who deals in spice. **SPICERY**, n. *-ī*, fragrant and aromatic substances used in seasoning food. **SPICY**, a. *spī'sī*, fragrant; aromatic; smart; racy; showy; piquant; pungent. **SPICILY**, ad. *-sī-lī*. **SPICINESS**, n. *-nēs*, the state or quality of being spicy. **SPICE-NUT**, small round pieces of ginger-bread spiced. **SPICE-WOOD**, the wild all-spice.—*Spices* are productions almost exclusively of tropical countries. In ancient times and throughout the middle ages, all the spices known in Europe were brought from the east; and Arabia was regarded as the land of spices, but rather because they came through it, or were brought by its merchants, than because they were produced in it, for they were really from the further east. They owe their aroma and pungency chiefly to essential oils which they contain. They are yielded by different parts of plants; some, e.g., pepper, cayenne pepper, pimento, nutmeg, mace, and vanilla, being the fruit or particular parts of the fruit; while some, e.g., ginger, are the root-stock; and others, e.g., cinnamon and cassia, are the bark. Tropical America produces some spices, being the native region of cayenne pepper, pimento, and vanilla; but the greater number are from the E. Indies.

SPICE ISLANDS: see **MOLUCCAS**.

SPICERY, SPICY: see under **SPICE**.

SPICK AND SPAN, a. *spīk, spān* [Eng. *spick*, and Icel. *spann*; Ger. *span*, a chip, a splinter]: bright as a *spike* just made, and a *chip* just split; bright; quite new.

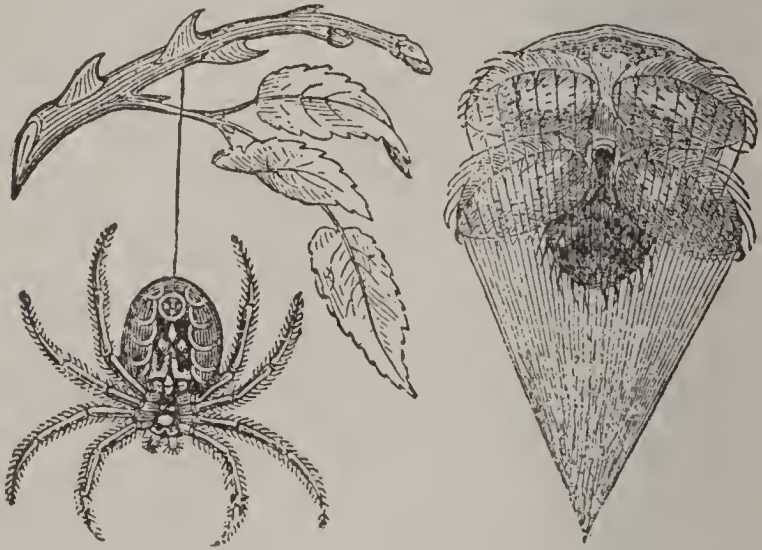
SPICULA, n. *spī'kū-lă* [L. *spīcŭlum*, a little sharp point, a dart—dim of *spīca*, *spīcum*, a spike, an ear of corn]: in *bot.*, a little spike. **SPICULAR**, a. *-lēr*, resembling a dart or spike; having sharp points. **SPICULATE**, a. *-lăt*, in *bot.*, covered with fine-pointed appendages; having a spike composed of several smaller spikes. **SPICULE**, n. *-kŭl*, a minute slender granule or point. **SPICULUM**, n. *-kŭ-lŭm*, **SPICULA**, n. plu. *-lă*, in *surg.*, a small-pointed piece of bone or other hard matter; in *zool.*, a term applied to minute siliceous or calcareous particles, generally needle-shaped, which are imbedded in the tissues of sponges and certain other animals.

SPIDER.

SPIDER, n. *spī'dér* [a corruption of *spīnder* — from SPIN, so named from *spinning* its web: Dut. *spin*; Ger. *spinne*; Dan. *spinder*; Sw. *spinnel*, a spider]: well-known insect that spins webs to ensnare its prey. SPIDER-LIKE, a. small-bodied and long-legged. SPIDER-WORT, a term applied to the *Tradescan'tia*, a genus of lily-like plants, ord. *Commelynacææ*.—*Spider* (*Aranea*), is Linnæan genus, now divided not only into many genera, but also into many families; and constituting a section (*Araneida*) of the class *Arachnida* (q.v.), and order *Pulmonaria*. The species are very numerous, and are found in all parts of the world, but most abundantly in tropical countries, which also produce the largest species, some of them capable of making very small birds, and not merely insects, their prey (see BIRD-CATCHING SPIDER). The *cephalothorax*, formed by the combination of the head and thorax into one piece, is covered with a kind of horny buckler, generally of oval form; the abdomen is attached to it by a short stalk, and is generally soft and tumid. Each of the eight legs consists of seven joints, the last armed with two hooks, usually toothed like a comb. The *frontal claws*, commonly called *mandibles*—which do not, however, correspond to the mandibles of insects, and move in an entirely different direction, up and down—are terminated by a sharp movable hook, which has near its extremity a small slit for emission of a venomous fluid secreted in a gland of the previous joint. The *maxillæ* are two in number, and between them is an organ called the *tongue*, forming part of the external apparatus of the mouth. The maxillæ are the basal joints of the *palpi*, which resemble very small legs, and are often terminated in the females by a small hook. but in the males by complicated and curious appendages, characteristic of the different genera and species. Spiders have generally eight eyes, the relative position of which varies remarkably in the different families and genera. A few species have only six eyes, and a very small number have only two. The upper surface of the abdomen generally shows impressed spots, most conspicuous in those kinds which have smooth naked skin. The pulmonary orifices are either two or four in number, and are near the base of the abdomen. Near the anus are several *spinnerets*, small protuberances, pierced at the extremity with a multitude of minute orifices, from which threads of extreme tenuity are produced, all these threads combining to form one thread of the *web*. The substance which exudes from the spinnerets is glutinous, and immediately dries into thread on coming in contact with the air. It is elaborated in reservoirs, which terminate in intestine-like tubes. All spiders have spinnerets, and produce threads, though all do not use them for the same purposes; for they differ very much in their habits: some employ their webs to catch their insect prey, while others depend for the capture of their prey on their powers of running and leaping; and some weave for themselves habitations, in which they live, while others select holes and crevices as abodes. Almost all spiders envelop their eggs in silken cocoons, which

SPIDER.

some of them tear open when the young are hatched; they are attentive to their young, some carrying them for a time on their back, while some carry the cocoons or egg-cases beneath their breast, and others carry them attached to the extremity of the abdomen. Nearly 2,000 eggs have been found in a single cocoon, and the young, when set free, may be seen swarming over the body of the mother, so as almost to conceal her from view. The female S. is, in many of the species, much larger than the male, and a remarkable danger attends the amatory approaches of the latter, as, if they are not favorably received, he is not uncommonly killed and eaten on the spot. Spiders are very pugnacious, and in their combats often sustain the loss of limbs; but, like crustaceans, they possess the power



Position of Spider when attached to a thread of web, and spinning apparatus highly magnified.

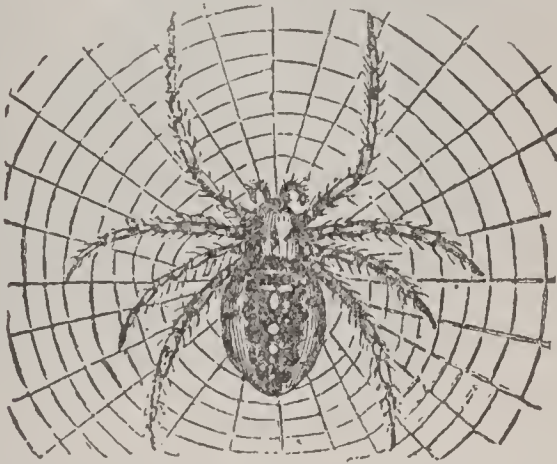
of repairing their loss. Like them also, they change their skin frequently during their growth; but they undergo no proper transformation. There is much similarity of form among all the multitude of kinds. Many have brilliant and beautiful colors, such as some of the Geometric or Garden S. of the family *Epeiridæ*, which weave geometric webs, and are often marked with bright yellow; one of them is known as the cross or diadem S. from its markings.

All spiders kill the insects and other small creatures on which they prey, by means of their venomous mandibles, and the bite of a house S. is quickly fatal to a house-fly. The bite of the larger species is dreaded even by man, being very painful, and producing inflammation and swelling often with much fever. Death has been known to ensue. But there is a general and groundless fear of S. in temperate climates, though the bite of some species may produce inflammation in some persons who are especially susceptible to any wound or slight poison. Even the dreaded Tarantula is rarely fatal.

Spiders' webs have long been in high repute for stanching wounds. Threads of this material are used also for the cross-wires of astronomical telescopes. Textile fabrics have been made of it, but only as curiosities.

SPIDER.

Spiders have been arranged by Walcknaer in five principal groups, distinguished by their habits. (1.) *Hunting Spiders*, which incessantly run about in the vicinity of their abode in quest of prey, some of them weaving silken tubes, in which they dwell, others hiding in fissures; some remarkable for the swiftness in running, others for their power of leaping to seize their prey. Some of them are of large size. Livingstone mentions a s. African one which can leap 12 inches. A small one in temperate climates is often seen, which, when leaping, avoids falling by suspending itself at the same moment by a thread. (2.) *Wandering Spiders*, which have no fixed residence, have the power of running sideways or backward, and throw out threads to entrap prey, but do not weave them into regular webs. Some live among plants, and place their egg-cases on leaves whose edges they bind together with their silk. (3.) *Prowling Spiders*, which have nests, but



Geometric Spider.

prowl about in their neighborhood, or in that of the threads which they spread to catch prey. (4.) *Sedentary Spiders*, such as the common house S., which spin large webs, and lie in wait at the middle or at the side: these are subdivided according to the fashion and structure of their webs. (5.) *Water Spiders*, which resemble the last group in their habits, except that they live in water, generally among the stems and leaves of aquatic plants, where they construct their webs. A very interesting species, one of the most interesting possible inmates of an aquarium, is the Common Water S. (*Argyroneta aquatica*) of Britain, frequent in deep ditches and ponds in parts of England. It is of brownish color, densely covered with hairs, which are of great importance in its economy, entangling air, which the animal carries down with it into the water, to supply its pulmonary sacs; for the water spiders all breathe by the same kind of organs as their terrestrial congeners. The eggs of the water S. are attached to the leaves or stems of plants under the surface of the water, and are protected by a dome-shaped web, so close in its structure as to retain the air which is brought into it, and in which the S. itself lives, bringing down air on its furred body till the dome is filled. The entrance is from

SPIDER FLY—SPIDER MONKEY.

below. Other water S. are minute and of brilliant scarlet or crimson, like similar land species. The most curious nests are those of the Trap door Spiders, belonging to the group *Territelariæ*, or underground weavers. The nest is a tubular burrow, lined with silk, and having the entrance covered with a circular lid of the same material attached to the edge of the lining by a kind of hinge. In the most common form of nest, the lid is made thick by having layers of earth between the layers of silk, and fits like a cork into the mouth of the tube, which is bevelled to receive it. As mosses grow on the lid as well as on the surrounding ground, the concealment is complete. In some types of nest, there is a thin external door, then one more solid a few inches below, behind which the inmate can place itself, and resist the intrusion of an enemy.



Trap-door, open.

In one kind of these double-door nests, a side-gallery branches off from the main one, and the external door is so placed at the angle that it can be made to shut either.

SPIDER FLY: general name for parasitic dipterous insects of the three different families, *Bracelidæ*, *Hippoboscidæ*, and *Nycteribiidæ*. According to the animal which they infest, they take the names Bat-louse, Bird-louse, Bee-louse, Sheep-tick, etc. They owe their name S. F. to a superficial resemblance to spiders. They are closely allied to the Forest Fly (q.v.): but the claws of the tarsi have three instead of two teeth. *O. avicularia* frequently infests the common fowl, and other birds: it is greenish-yellow, with smoke-colored wings.

SPIDER MONKEY: name often given to species of the genera *Ateles* and *Brachyteles*, small American monkeys, on account of their very long, slender, inelegant limbs. The tail is very long, and not only prehensile in the highest degree, but endowed with a wondrous sensitiveness of touch. These monkeys show much intelligence. It is their common practice to break nuts by means of stones; a tame one has been known to try a larger stone if the first did not serve its purpose, and even to take it up in both paws, and dash it upon the nut, jumping quickly aside to avoid injury to its toes. This animal generally rode on the back of a large mastiff, and in descending a steep hill,

SPIEGEL-EISEN—SPIGNEL.

would curl its tail round the root of the mastiff's tail. to make its seat secure.



Spider Monkey.

SPIEGEL-EISEN, n. *spě'gěl-īs'ën* [Ger. *spiegel*, a mirror; *eisen*, iron]: peculiar kind of cast-iron, so called from its shining or specular crystalline fracture: see **BESSEMER STEEL**: **KRUPP'S STEEL**.

SPIGELIA, *spī-jě'li-a*: genus of plants of nat. order *Loganiaceæ*, having a calyx glandular inside, a long slender valvate corolla, long filaments, and a capsule of two *cocci*, splitting around at the base: they are named in honor of Adrian Vander Spiegel.—*S. Marilandica*, often called **WORM GRASS** and **CAROLINA PINK**, is native of the s. United States, a perennial plant with simple quadrangular stem. It is 6–18 in. high, its spiked flowers $1\frac{1}{2}$ in. long, slender, red outside and yellow within. The root (**PINK ROOT**) is purgative, narcotic, and poisonous, but is a powerful vermifuge much employed in the U. S.—*S. Anthelmia*, annual, native of tropical America, with very small purplish flowers, in spike-like racemes, possesses similar properties. The efficacy of both is, however, impaired by keeping; and they are apt to produce unpleasant symptoms when used as medicines. Other species are known as poisons.

SPIGNEL, n. *spīg'něl* [said to be a corruption of *spike-nail*]: a wild umbelliferous plant; *Meum athaman'ticum*; also **SPICKNEL**.

SPIGOT—SPIKENARD.

SPIGOT, n. *spġ'ōt* [L. *spīca*, a spike: W. *ysbigod*, a spigot; *ysbig*, a spine: Gael. *spiocaid*, a spigot]: a peg to stop the vent-hole of a cask or the pipe of a faucet; the *faucet* is the pipe in the cask for drawing off liquor.

SPIKE, n. *spġk* [Sw. *spik*, a nail: Low Ger. *speke*; Ger.

speiche, the spoke of a wheel: L. *spīca*, an ear of corn, a point]: a large nail; a pointed bar of iron, sometimes of wood; the iron rod driven into the vent of a gun.—In *bot.*, an inflorescence consisting of numerous flowers, sessile (i.e., with very short stalks), on an axis or single stem, as in the wheat and lavender; an ear of corn. In rye, wheat, barley, darnel, and many other grasses, there is a sort of compound spike; i.e., the flowers or fruits are arranged together in spikelets, upon short stalks, which again surround the top of the culm



a, Spike of *Plantago major*; *b*, section of it to show the sessile flowers; *c*, spike of *Lolium perenne*; *d*, spikelet of same.

in the form of a spike. The catkin, the spadix, and the cone may be regarded as varieties of the spike. **SPIKE**, v. to fasten with spikes or large nails; to set with spikes; to drive into the touch-hole of a cannon a spike or long nail (see **SPIKING OF CANNON**). **SPIKING**, imp. **SPIKED**, pp. *spġkt*: **ADJ.** having spikes; having ears or those parts containing seed; formed as a spike; terminating in a sharp point. **SPIKY**, a. *spġkġ*, sharp-pointed. **SPIKELET**, n. *spġk'lġt*, a small spike; in *bot.*, the small cluster of flowers within the glumes in grasses.

SPIKENARD, n. *spġk'nārd* [L. *spīca-nardī*, a spike or ear of nard: Ger. *spieke*, spikenard: Eng. *spike*, and *nard*]: the *spike* or ear of the *nardus*, which is highly aromatic; the plant itself, or an oil extracted from it. Spikenard was highly prized as a perfume by the ancients, and used both in baths and at feasts. It was brought from India, and was very costly. The 'ointment of spikenard' (John xii. 3) was probably an oil or fat, impregnated with the perfume. The plant which produces it has been ascertained by the researches of Sir William Jones and Dr. Royle to be the *Nardostachys jatamansi*, the Jatamansi of the Hindus, a small plant of nat. order *Valerianaceæ*, native of the mountains of n. India, and found at least as far s. as the Deccan. It grows on the Himalaya as far as the altitude of 18,000 feet, and its roots are a favorite perfume in Tibet and Nepaul. The ladies of Nepaul use oil in which the root has been steeped for perfuming their hair. The odor is not, however, generally agreeable to Europeans: it is intermediate between Valerian (q.v.) and Patchoule (q.v.). The root, 3 to 12 inches long, sends up many stems, with little spikes of purple flowers, which have four stamens.—The name Spikenard (*nardos*) was given by the ancients to perfumes used as substitutes for

SPIKING—SPILTH.

the true or Indian spikenard; some of which were derived from the roots of plants of the same nat. order, the kind called Gallic or Celtic spikenard from those of *Valeriana Celtica* and *V. salicina*, which are still used in the East for perfuming baths; and that called Cretan spikenard from roots of *V. Italica*, *V. tuberosa*, and *V. phu*. All these grow on the Alps and other mountains of s. Europe, and the peasantry of Styria and Carinthia collect them from rocks on the borders of perpetual snow. They are tied in bundles, and sold at a very low price to merchants, who sell them at a great profit in Turkey and Egypt, from which they are partly transmitted even to India. About 60 tons are annually exported from Trieste.

American S. is a herbaceous plant having a short thick rootstock which is used medicinally instead of sarsaparilla: its botanic name is *Aralia racemosa*, and it is a congener of wild sarsaparilla, the angelica tree, and small Spikenard (*Aralia nudicaulis*).

SPIKING OF CANNON: operation of rendering a cannon useless without expenditure of much time and labor. It is resorted to by troops compelled to abandon their own ordnance, or unable to remove pieces of the enemy's which they have captured. The process consists in driving a Nail or spike into the vent or touchhole, and then breaking it off short with a hammer. Spikes for this purpose may have a spring on the side at the end, which can be compressed in driving through the vent, and will open again when the end has passed through. Sometimes, if the gun be of brass, a few drops of sulphuric or nitric acid on the touch-hole will render it practicable to extract the spike. Often the resort must be to the tedious process of drilling out the spike or boring a new vent.

SPILE, n. *spīl*, or **SPILL**, n. *spīl* [Ger. *spille*, a pin: It. *spillo*, a pin, a small hole]: the vent-peg of a cask: V. to bore a hole for a peg and to let in the air, as in a cask. **SPIL'ING**, imp. **SPILED**, pp. *spīld*. **SPILE-HOLE**, a small hole in a cask for air, that can be plugged with a peg.

SPILL, v. *spīl* [Low Ger. *spillen*, to shed, to waste: Ger. *spülen*; Sw. *spola*, to wash or rinse]: to suffer a liquid or any powder to run over, or to fall out of a vessel; to shed, used especially of blood; to be lost or wasted; in *OE.*, to waste; to injure. **SPILL'ING**, imp. **SPILED**, pp. *spīld*, or **SPILT**, pp. *spīlt*: **ADJ.** poured out or wasted. **SPIL'LER**, n. *-lēr*, one who spills; a kind of fishing-line. **SPILLING-LINES** in a *ship*, certain ropes used to dislodge the wind from a sail in order to furl it the more easily. *Note.*—To *spill* expresses an accidental loss, as distinguished from to *pour*, which implies voluntary action.

SPILL n. *spīl* [Dut. *speld*, *spīl*, a pin]: a thin slip or splinter of wood; a chip; a small bar or pin of iron pointed; a small roll of paper, or thin slip of wood, for lighting a lamp.

SPILT, v. *spīlt*: see under **SPILL** 1.

SPILTH. n. *spīlth* [see **SPILL** 1]: in *OE.*, anything wasted.

SPIN—SPINACH.

SPIN, v. *spĭn* [Icel. *spinna*; Dan. *spinde*; Dut. and Ger. *spinnen*, to spin; comp. Gael. *spion*, to draw out]: to draw out and twist into threads or yarn (see **SPINNING**): to extend to a great length; to draw out to a tedious length; to whirl or turn rapidly as by means of thread—applied to the motion of any body on its axis, as a top; to exercise the art or trade of drawing out into threads; to issue in a very small current. **SPIN'NING**, imp.: N. the art or practice of drawing out into threads, as wool, cotton, flax, etc. **SPAN**, pt. *spĕn*, or **SPUN**, *spĭn*, did spin. **SPUN**, pp. *spĕn*. **SPINNER**, n. *spĭn'nĕr*, one who spins; a spider. **SPIN'NERET**, n. *-ĕt*, in *insects*, an organ with which they form their silk or webs. **SPIN'STER**, n. *-stĕr*, one who spins; hence in *law*, the term applied to a maiden or unmarried female. **SPINNING-JENNY**, machine for spinning wool or cotton, consisting essentially of a large number of spindles made to revolve simultaneously (see **SPINNING**). **SPINNING-WHEEL**, machine for spinning yarn or thread, driven by the hand, or by the foot acting on a treadle. To **SPIN A YARN**, among *sailors*, to tell a tale. To **SPIN OUT THE TIME**, to take means to occupy as much of it as possible to serve a purpose; to protract.

SPINA BIFIDA, *spĭ'nĕ bĭf'ĭ-dĕ* [L. *cleft spine*]. congenital malformation, occurring perhaps more frequently than any other except hare-lip, and arising like it from arrest of development: it is a congenital hernia of the membranes of the spinal cord, through a fissure in the wall of the bony canal. A tumor is thus formed, usually of roundish shape, varying in size from that of an egg to that of an adult head, in the lumbar or the sacral region of the vertebral column, and adhering to the adjacent vertebræ either directly or by a pedicle. It is often accompanied with paralysis of the lower extremities. The usual termination of the disease is death. As the size of the tumors increases, fatal convulsions ensue; or the skin investing the tumor may ulcerate, and the contents escape, in which case palsy or convulsions produce death; yet patients with this affection have survived till middle life. Active surgical treatment usually hastens death, and should be resorted to only in most urgent circumstances. Moderate support by means of a hollow truss, or a well-padded concave shield, may tend to keep the disease stationary; and any interference beyond this is, in the great majority of cases, unadvisable.

SPINACH, n., or **SPINAGE**, n. *spĭn'āj* [It. *spinace*; Sp. *espinaca*, spinach—from L. *spĭna*, a spine: so named from its prickly fruit]: a garden plant whose leaves are used as a table vegetable. **SPINACEOUS**, a. *spĭ-nĕ'shĭs*, pertaining to spinach.—*Spinach* (*Spinacia*) is a genus of herbaceous plants, of nat. order *Chenopodiaceæ*; dioecious, the male flowers consisting of a 4-parted perianth and four stamens; the female of a 2-3 cleft perianth and a germer with four styles; the perianth hardening around the fruit as it ripens; the fruit an achénium. **COMMON S.**, or **GARDEN S.** (*S. oleracea*), is in general cultivation for its young leaves, which are a favorite and wholesome vegetable. **GRE**

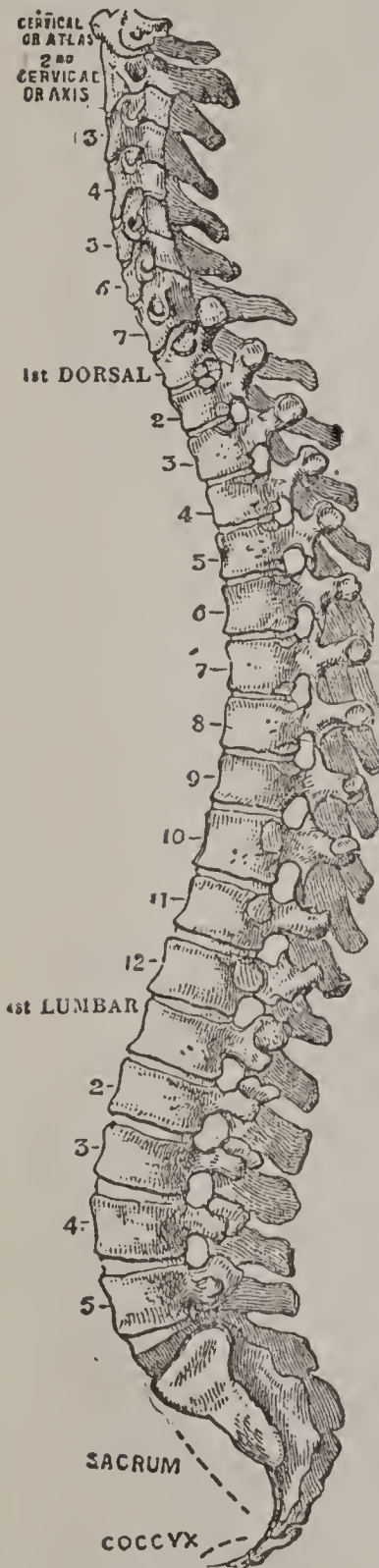
SPINAL COLUMN.

parea either by boiling, or by frying with a little butter. S. is an annual. Its stem rises two to four ft.; the male flowers are in long spikes, the female in clusters close to the stem. There are about 20 varieties. The soil should be very rich and thoroughly pulverized. Sowing is to be in drills 12 to 15 in. apart, and, if a succession is desired, should be done at intervals of three weeks; though for the fall crop Aug. and for spring use Sep. or Oct. is the usual time. From 10 to 15 lbs. of seed per acre will be required, and if the ground is dry it must be pressed very firmly upon the seed. Frequent cultivation is needed, and if the plants are crowded they should be thinned. S. is grown sometimes between the rows of crops which require a longer time for development, the S. being ready for use in 4 to 6 weeks after seed is sown. At the north, S. should be lightly covered with straw or leaves if left in the ground over winter. This crop is grown extensively in the neighborhood of large cities, in open ground, also under glass, and considerable quantities are grown at Norfolk and other s. points for n. markets. The price fluctuates greatly, from 50 cents to several dollars per barrel.—S. is probably a native of w. Asia. The name is given also to a number of other plants of very different botanical characters, but which have the same qualities, and are used as substitutes. Of these one of the most important is NEW ZEALAND S. (*Tetragonia expansa*), which has thick leaves and endures the heat of summer better than the common S.—Other substitutes are Orache (*Atriplex Hortensis*), Kale (q.v.), and Strawberry Blite (*Blitum Capitatum*)—the latter being valuable mainly for its hardiness and its ornamental appearance.

SPINAL COLUMN, or SPINE, THE: most important and characteristic part of the skeleton of the highest animal sub-kingdom, which includes Mammals, Birds, Reptiles, Amphibians, and Fishes: see SPINE: SKELETON. The vertebræ vary greatly in number in different animals, and even in members of the same class, and the number has no apparent relation to the other organs of the animal. Moreover, in shape they differ extremely even in different parts of the same spine, in accordance with their special functions. In man, the number of vertebræ which collectively form the spinal column is 7 in the neck (cervical vertebræ), 12 in the back (dorsal vertebræ), 5 in the loins (lumbar vertebræ)—all capable of being detached from one another, and termed *true* vertebræ; and 5 vertebræ ossified together and forming the sacrum, and 4 or 5 similarly united, forming the termination of the column, and constituting the bone called the coccyx—known as *false* vertebræ. However long or short the neck may be, every mammal has 7 cervical vertebræ, excepting the three-toed sloth, which has 9, and the sea-cow, which has 6. In the other regions of the spine, no such law exists. Each vertebra is attached to the two between which it lies by numerous strong and more or less elastic ligamments, and between each pair of vertebræ there is interposed a lenticular disk of fibro-cartilage which acts as a buffer. Thus the S. C. is

SPINAL COLUMN.

rendered highly elastic, the communication of jars or shocks is prevented, and a considerable general range of movement permitted, though the motion between any two adjacent vertebræ is slight. The elasticity of the column is further increased by the component vertebræ being ar-



Spinal Column.

anged in curves instead of perpendicularly. The curves should be exactly in the antero-posterior direction, any well-marked lateral deviation from the perpendicular being abnormal (see SPINE, CURVATURE OF THE); but a very slight lateral curvature with the convexity to the right may often be detected in upper and middle parts of the back, and is supposed to be dependent on the more frequent use and greater strength of the right arm as compared with the left. These curves are termed from their position the cervical, dorsal, lumbar, and pelvic curves. The dorsal and pelvic curves have their concavities in front, and thus enlarge the spaces in which the thoracic and pelvic viscera are contained; the two other curves are convex anteriorly, and thus afford support to the parts above them. The upper three curves are so arranged that their cords are in the same vertical line in the erect position of the body, and this vertical line corresponds with the line of gravity of the head. The cause of these curves is to be sought partly in the shape of the vertebral bodies, partly in that of the intervertebral substance. Among the uses of these curves are: (1) they enable the spine to bear greater vertical weight than it could otherwise maintain; it is calculated that nine times as great a vertical force is required to bend it as if it had been straight; (2) they facilitate the movements of the body, especially in the act of running; (3) they are so disposed as to protect the cord in movements of the spine. Similar curves are seen in the spine

of other mammals, though the degree of flexure is liable to great deviations: the lumbar curve, which has especial reference to the erect position, is always much less marked than in man.

SPINAL CORD.

The vertebral canal formed by the apposition of the spinal foramina, or neural arches (see SKELETON), and containing and protecting the spinal cord, varies in its size at different parts of the column. It is largest in its antero-posterior diameter in the neck and loins (measuring at the last lumbar vertebra $\frac{7}{8}$ of an inch), where the antero-posterior movements of the spine are greatest, and where the cord is least closely attached to the vertebræ; while in its lateral diameter it is greatest at the atlas, where it measures nearly an inch and a half. A transverse section of the canal is nearly circular through the greater part of the back. The intervertebral foramina through which the nerves emerge vary in shape and position in different parts, but are always of sufficient size to prevent injurious pressure on the nerves during movement of the spine; and in the dorsal region, which is the ordinary seat of angular curvature, the nerves are so protected by bony arches that they may escape injury even when the bodies of several dorsal vertebræ have been destroyed by ulceration.

SPINAL CORD (or SPINAL MARROW), THE: that elongated part of the cerebro-spinal axis (see NERVOUS SYSTEM) contained in the spinal canal, from the brain superiorly to the first or second lumbar vertebra inferiorly (in man), where it merges into the *Filum terminale*, which extends to the lower end of the sacral canal, and in no way differs structurally from the proper spinal cord, except that no nerve-roots are connected with it. (For an account of

the membranes by which it is protected from danger, and kept in its proper position, see NERVOUS SYSTEM.) Its length varies from 15 to 18 in., and it presents a difference in its diameter in different parts, there being an upper or cervical, and a lower or lumbar enlargement. In form it is a flattened cylinder. It is almost completely divided, along the median plane, by an anterior and posterior fissure, into two equal and symmetrical parts. The anterior fissure is more distinct and wider at the surface than the posterior fissure, but it penetrates to only about one-third of the thickness of the cord, while the posterior fissure extends to about half the thickness of the cord. The two halves are hence united only near the centre by a commissural band, which is traversed by the 'spinal canal' (fig. 2, f), extending downward from the fourth

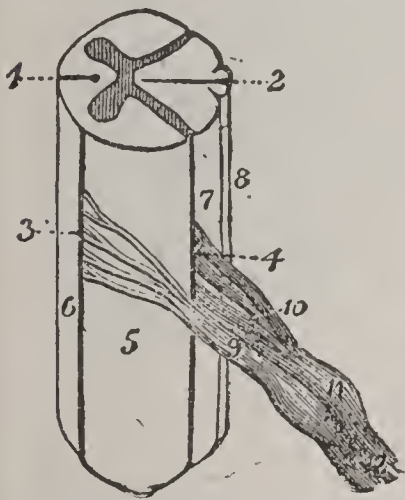


Fig. 1.—Side-view of the Spinal Cord, showing the Fissures and Columns:

- 1, anterior median fissure;
- 2, posterior median fissure;
- 3, anterior lateral fissure;
- 4, posterior lateral fissure;
- 5, lateral column; 6, anterior column; 7, posterior column; 8, posterior median column; 9, anterior root;
- 10, posterior root; and 11, ganglion of (12) a spinal nerve.—From Gray's *Human Anatomy*.

ventricle (see BRAIN), and about one-hundredth of an

SPINAL CORD.

inch in diameter. A posterior and an anterior lateral furrow (two shallow depressions, the latter scarcely perceptible) further divide each half of the cord into a posterior, a lateral, and an anterior column; these two furrows corresponding with the lines of attachment of the posterior and anterior nerve-roots. The separation of the antero-lateral columns into the 'anterior' and the lateral columns (A, A, and L, L, in fig. 2) is made more obvious internally by the mode in which the gray or vesicular nervous matter (see NERVOUS SYSTEM) is arranged in relation to the white or fibrous matter. Although the distribution of the gray matter differs considerably in different parts of the S. C., it usually presents in a transverse section the form of two somewhat crescent-shaped masses, whose convexities are turned toward each other and connected by the gray commissure, while their cornua are directed toward the surface of the cord: the posterior peak on each side nearly reaches the posterior lateral furrow; while the anterior, though the larger cornu, does not approach quite so near the surface at the assumed anterior furrow. The



Fig. 2.—Magnified View of Transverse Section of the Spinal Cord through the Middle of the Lumbar Enlargement: showing, on the right side, the course of the Nerve-roots, and on the left, the position of the principal tracts of Vesicular Matter.

A, A, anterior columns; P, P, posterior columns; L, L, lateral columns; a, anterior median fissure; p, posterior median fissure; b, b, b, b, anterior roots of spinal nerves; c, c, c, c, posterior roots; d, d, tracts of vesicular matter in anterior column; e, tracts of vesicular matter in posterior column; f, spinal canal.—After J. L. Clarke.

enlargement of the S. C. in the cervical and lumbar region, where the great nervous plexuses are given off, is due chiefly to the increase, at those points, of gray matter, which is comparatively deficient in the interval between them. The white substance seems to increase regularly from the lower to the upper part of the S. C.; and this fact, as Dr. Carpenter remarks, seems to indicate that the longitu-

SPINAL CORD.

dinal columns serve (as formerly supposed) to establish a direct connection between the encephalic centres and the roots of the spinal nerves. Careful microscopic investigation has revealed the fact that the root-fibres of the spinal nerves run two very distinct courses in the substance of the cord; the first *transverse*, and the second *longitudinal*. The transverse fibres traverse the cord horizontally or obliquely, and appear to pass out in the other set of roots connected with the same segment, either on its own or on the opposite side of the median fissure; while the longitudinal fibres in part connect the posterior roots directly with the posterior column without passing into the vesicular matter, but for the most part enter the gray matter, and emerge from it into the posterior column, or into the posterior part of the lateral column of the same or the opposite side. How far these longitudinal fibres run up or down the cord, is undecided. It is probable that *some* of them are longitudinal commissures, serving to connect the nerve-roots of one segment of the cord with the vesicular matter of another above or below it; and it is possible that *all* are of this character, in which case the S. C. will be the real centre of all the nerve-fibres connected with it.

In considering the functions of the S. C., we have to regard it in two distinct points of view—first, as a *conductor* of nervous force between the nerve-trunks and the brain; secondly, as an *independent nervous centre*. As a mere *conductor* of nervous force, its functions and behavior are the same as those of a nerve-trunk; for, as Dr. Carpenter observes, ‘if it be divided, all the parts of the body which are solely supplied by nerves coming off below the point of section are completely paralyzed, as far as regards sensibility and voluntary movement; no impressions made upon them having the least power to affect the consciousness, and no exertion of the will being able to determine contraction of the muscles. This state of *paraplegia*, which may be experimentally induced in animals, is frequently exhibited in man, as a result of injury or of disease that seriously implicates the spinal cord; and as it has been shown that among the lower animals complete reunion of the cord may take place after complete division, as indicated by the entire restoration of its functional powers, and the complete redintegration of its structure, so have we reason to believe that a similar regeneration may take place, to a considerable extent, in man, this being marked by a gradual return of sensibility and power of voluntary movement in the lower limbs, which had been at first completely paralyzed.’—*Human Physiology*, 6th ed. 529, 530. There can be little doubt that the gray matter is essentially the conductor of *sensory* impressions; for if the anterior, posterior, and antero-lateral columns are divided as completely as possible, the gray substance remaining uninjured, the sensibility of the parts below is unaffected; while, conversely, if the gray substance is divided, while the white columns remain uninjured, sensibility is almost totally extinguished. Dr. Brown-Séquard, whose researches on the nervous system are of great importance, has shown that the

SPINAL

central portions of the gray substance are the most effective in the transmission of sensation. Notwithstanding its singular power of conducting sensory impressions, the gray substance is itself insensible. Among his other remarkable discoveries in connection with this subject, Dr. Brown-Séquard has found that, on dividing one-half of the S. C. of an animal, not only is anæsthesia (or loss of sensation) established on the opposite side of the body, but there is also produced a state of hyperæsthesia (or exalted sensibility) on the same side, which begins to appear a few hours after the operation, and continues, in dogs about 20 days, in cats about 14 days, in guinea-pigs many months; after which the sensibility falls below its usual standard. With regard to the conduction of *motor* impulses, there is great uncertainty. Considerable differences have been shown in the position of the motor tracts in different parts of the cord, and Dr. Brown-Séquard concludes, from his experiments on the effects of section, that, while in the dorsal region all parts, except the posterior columns, are employed in the conveyance of the orders of the will to the muscles, in the upper part of the cervical region most of these conductors are in the lateral columns and in the gray substance between these and the anterior column.

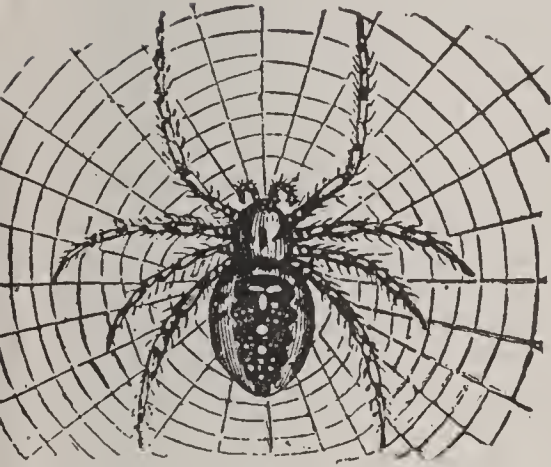
We have now to consider the S. C. as an *independent nervous centre*. The simplest and at the same time most decisive evidence of the independent power of the S. C. is derived from the motion exhibited by the limbs of animals when irritation is applied to them after section of the cord at some point above the entrance of their nerves; the fact that these movements are reflected through the cord, and do not result from direct stimulation of the part irritated, being shown by their complete cessation when the nerve-trunks are divided. Thus, if a frog be pithed by dividing the cord between the occipital foramen and the first vertebra, an unusual convulsion takes place while the knife passes through the nervous centre; but this quickly subsides, and if the animal be placed on the table, it will resume its ordinary position. It is quite unable to move by any voluntary effort; but if a toe be pinched, the limb is instantly drawn up, and seen to push away the irritating agent and then draw itself up again to the old position.

From these and other experiments, we may conclude (1) that the S. C., *in union with the brain*, is the instrument of sensation and voluntary motion to the trunk and extremities; (2) that the S. C. may be the medium for the excitation of movements, *independently* of volition or sensation, either by direct irritation of its substance, or by the influence of a stimulus conveyed to it from some surface of the trunk or extremities by its nerves distributed on that surface.—See further, Carpenter's *Human Physiology*, 8th ed. 1876; and the other standard works on Physiology.

SPINAL, SPINESCENT: see under SPINE.



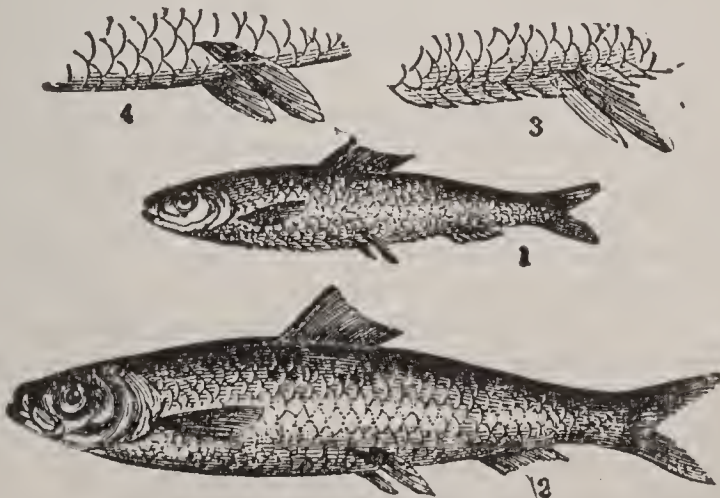
Various Species of Spiders.



Geometric Spider.



White Spoon-bill (*Platalea leucorodia*).



Sprat and Herring.

1, sprat; 2, herring; 3, belly of sprat; 4, belly of herring.

SPINAZZOLA—SPINE.

SPINAZZOLA, *spē-nât'sō-lâ*: city of s. Italy, province of Bari, 7 m. s. of Minerviuo. The country around is very fertile, and produces grain in abundance.—Pop. (1881) 10,548.

SPINDLE, n. *spīn'dl* [Ger. *spindel*, a spindle: AS. *spinl*, a spindle—from *spinnan*, to spin (see SPIN)]: the pin or thin rod, formerly used in spinning, for twisting the fibres drawn from the distaff; any axis of revolution, as the axis of a wheel, of a capstan, etc.; a yarn-measure: V. among *gardeners*, to put forth a long and slender stalk. **SPIN'DLING**, imp **SPIN'DLED**, pp. *-dld*. **SPINDLE-LEGGED** or **-SHANKED**, having long, slender legs.

SPINDLE TREE (*Euonymus*): genus of plants of nat. order *Celastraceæ*. This order contains about 260 known species, all small trees or shrubs.—The genus *Euonymus* has a lobed capsule, and seeds surrounded by an aril, which in some of the species is remarkable for brilliancy of color. The Common Spindle Tree (*E. Europæa*), native of Britain and of great part of Europe, is ornamental when in fruit, and its aril is of fine orange color: it is a shrub rather than a tree, and is inferior to the American species. The wood is hard and fine-grained, and is used for finer articles of turnery and for skewers: formerly it was used for making musical instruments and for spindles, whence the name of the shrub. In Germany, the shoots are bored for tubes of tobacco-pipes. Charcoal made of its small shoots is valued for crayons.—*E. atropurpurea*, a species native to the United States, also is popularly called *Spindle Tree*, but more commonly known as the Wahoo and the burning-bush. *E. Americanus*, the Amer. Strawberry-bush, a lower shrub, has 3-lobed fruit, instead of 4-lobed, like the preceding. *E. Japonicus* is a greenhouse plant at the north.

SPINE, n. *spīn* [L. *spīna*, a thorn, the spine: It. *spina*; F. *épine*, the spine]: a spike or thorn; a thin sharp-pointed thing; the vertebral column or backbone (see SPINAL COLUMN): in *bot.*, an abortive branch with a hard sharp point (see below). **SPINY**, a. *spī'nī*, full of spines; thorny; difficult; slender. **SPI'NINESS**, n. *-nēs*, the state or quality of having spines. **SPI'NAL**, a. *-nāl* [F. *spinal*—from L. *spinālis*, spinal]: of or relating to the backbone. **SPINAL COLUMN**, the connected vertebræ of the back, or its cartilaginous substitute, forming the sheath for the spinal cord; the backbone (see above). **SPINESCENT**, a. *spī-nēs'sēnt*, in *bot.*, terminating in a spine; tapering to a rigid leafless point; tipped with a spine. **SPINIFORM**, a. *spī'nī-faŭrm* [L. *forma*, shape]: like a spine or thorn. **SPI'NOSE**, a. *-nōs*, or **SPI'NOUS**, a. *-nūs*, full of spines; thorny. **SPI'NULE**, n. *-nūl*, a minute spine. **SPI'NULOSE**, a. *-nū-lōs*, or **SPI'NULOUS**, a. *-lūs*, covered with or bearing minute spines. **SPINAL CORD**, or **SPINAL MARROW**, grayish-white nervous matter lodged in the interior of the spinal column or backbones, the axial nervous system of the body—a continuation of the brain (see above).

SPINE.

SPINE, CURVATURE OF THE: malady known in two perfectly distinct forms: LATERAL CURVATURE—arising from weakness of the bones, ligaments, and muscles, and fearfully common in girls between the ages of 10 and 16, whose muscular system is weak and who are growing rapidly; and ANGULAR CURVATURE (frequently known as POTT'S CURVATURE, or the MALADY OF POTT, from that eminent surgeon having been the first to describe its true nature), which consists of caries of the bodies of the vertebræ, and is by far the more serious affection of the two.

Lateral Curvature, or *Distortion*, denotes deformity of the bones of the spine and chest, with corresponding change of the structures in relation to them. It is called 'lateral' from the spine being curved sideways; and to distinguish it from 'angular' deformity, in which the spine is directed from behind forward, owing to excavations in its forepart from caries. The first symptom usually to attract attention is a projection of one scapula, or an elevation of one shoulder, generally the right; the right shoulder and the right side of the chest being unnaturally high and rounded, while on the left side the shoulder is depressed, and the side of the chest concave. On examination, the spine is found to have acquired a spiral appearance. In advanced stages of the distortion, the dorsal curve increases abruptly to such an extent as to render it angular, the attending contortion being similarly abrupt. This condition gives rise to various changes, including a *humped* appearance, great displacement of the ribs, diminution of the cavity of the chest, and proportionate wasting of the lung. In consequence of these physical changes, the patient can no longer walk in a simple and natural manner, but with halting, jerking, awkward gait.

The following are among principal causes of lateral curvature: 1. The suppleness of the spine in the young, its structures being then more gristle than bone, and the column virtually immature. 2. Weakness of the muscles, which often are not properly exercised in girls of the age at which this disorder occurs. This muscular debility is usually followed by deterioration of the bones and their ligaments; and this, apart from other obvious and direct bad effects, tends to make all the component parts of the spine—vertebræ and articulations—more prone to yield to the superincumbent weight, and to become distorted. These evil results are increased by prolonged stooping, or by a habit of standing and throwing the weight of the body constantly on one leg. Such attitudes may be observed in a school-room. Many of the pupils, will be seen instinctively relieving the pain of over-fatigue by throwing the weight on the insensible fibrous structures, thus relieving the aching muscles. When such attitudes are long indulged in, the ligaments undergo a process of over-stretching, and a general looseness of the vertebral joints is the result. By standing on one leg, or, more correctly speaking, by throwing all the weight of the body on one foot, the body is kept upright with the least possible expend-

SPINE.

iture of muscular power: hence a weak and fragile girl is induced to adopt this position. Too long indulgence in this habit will, to a certainty (for anatomical reasons, into which we have not space to enter), aggravate existing curvature, or induce it if it do not already exist.

However slight a curve in the spine of a young person may be, it ought to be deemed important; for when the column inclines laterally even to a slight degree, the superincumbent weight ceases to be supported on the line of the vertical axis, and falls on the oblique processes of the side to which the person leans; and these processes becoming rapidly diminished in length by absorption, induced by this abnormal pressure, general distortion soon begins. Distortion beginning at the age of 10 is more dangerous than at 14, because the disease runs a more rapid course in the younger cases. A cure is, for the same reason, more easily effected in the younger patient. If the patient's age be beyond 16, little can be done beyond checking the further progress of the deformity.

When a girl is defective in muscular power, disinclined to take exercise, and prone to distortion of the spine, the sitting position does not afford her rest, in consequence of the great efforts requisite to keep the body erect. A patient in that condition will be benefited by regularly lying two or three hours daily, at divided intervals, on a sofa or board. When the deformity has actually occurred, gymnastic exercises suggested by the medical attendant will frequently, when continued for some time, have the effect of loosening the connection of the bones, of facilitating their falling into their proper places, when extension is employed, and of restoring to the spine a portion of its lost suppleness. Or, let the patient lie on one side, with a firm cylindrical pillow, six inches in diameter, placed under the gibbosity of that side, and let her rest her weight on the pillow: the effect will be to counteract and reverse the curve. The same may be done alternately on the two sides. The posture may be continued each way for a quarter of an hour at a time, and be repeated twice or thrice daily. There are two methods of extending the curved spine—(1) by stretching the body while the patient is recumbent; (2) by letting the patient remain upright, and using spinal supports. As each method has its own advantages, a combination of them will often afford the best results. The chief objections to the former are the necessary confinement, comparative seclusion, and interference with the routine of study. Any mode of treatment with the view of producing extension of the spine must be continued for months, to be of any avail. As to the various extending beds, apparatuses for exercise, and different kinds of spinal supports, devised by surgeons and anatomical mechanics—it is to be observed merely that mechanical supports must be tried with great caution. They are always more or less irksome to bear, and if they are not doing good, are almost sure to be doing harm.

For *Angular Curvature*, see POTT'S DISEASE.

SPINE—SPINIFORM.

SPINE, or **THORN**, in Botany: sharp-pointed projection of the wood of a stem or branch; differing essentially from a Prickle (q.v.) in being connected with the wood and covered with bark. A spine is, in fact, a branch arrested in its growth and modified. In some trees and shrubs, e.g., the sloe, branches which bear leaves often terminate in a spine. Cultivation, or whatever tends to increase luxuriance of a plant, diminishes the tendency to produce spines. The name spine is given also to the sharp extremities of the midrib of leaves, and to the sharp angular projections of the margin of hard leaves, as in the holly. In some plants, the stipules are metamorphosed into spines.

SPINEL, n. *spin'ël* [F. *spinelle*; It. *spinella*, the spinel ruby]: an aluminate of magnesia, forming a precious stone of various tints, red, blue, green, black. *Spinel Ruby*, often *Ruby*, is a name applied to the scarlet varieties of spinel; *Balas Ruby* is a rose-red S., and *Almandine Ruby* is a violet S.—S. occurs in crystals, often octahedral, found chiefly in Ceylon and Siam. It is allied to Corundum (q.v.); and consists, when pure, of 72 per cent. of alumina, with 28 per cent. of magnesia: a part of the magnesia is often replaced by other protoxides; hence the varieties of S., distinguished by their colors.

SPINET, n. *spin'ët* [OF. *espinette*; It. *spinetta*, a spinet—from L. *spīna*, a spine, so called because struck with a pointed quill]: musical instr. resembling the harpsichord, not now in use. The S. was smaller and weaker than the harpsichord, and, like it, was one of the precursors of the Pianoforte (q.v.). Each note



Spinet.

had but one string, which was struck by a quilled jack acted on by one of the finger-keys. The strings were placed horizontally and nearly at right angles to the keys, as in the square pianoforte; and the general outline of the instrument nearly resembled that of a harp laid in horizontal position, with the keys occupying the position of the sounding-board; on which account the S., when introduced, was called the couched harp.

SPINIFEROUS, a. *spī-nīf'ér-ūs* [L. *spīnīfer*, thorn-bearing, prickly—from *spīna*, a thorn; *fero*, I bear]: in bot., producing or bearing spines or thorns; thorny. **SPINIFERITES**, n. plu. *-īts*, in *geol.*, a term applied to those minute spherical bodies beset with spines which occur in the chalk and flint.

SPINIFORM, **SPINOSE**, **SPINOUS**, etc.: see under **SPINE**.

SPINNER—SPINNING.

SPIN'NER, FRANCIS ELIAS: financier: 1802, Jan. 21—1890, Dec. 31; b. German Flats (Mohawk), N. Y. He learned the trade of harness-maker; at the age of 22 engaged in business at Herkimer, N. Y.; became a deputy-sheriff 1829, maj.gen. of a division of the state artillery 1834; and from 1839 was connected with the Mohawk Valley Bank for 20 years as cashier and as pres. He was an officer at the port of New York 1845-49; member of congress, first as an anti-slavery democrat, afterward as a republican, 1855-61; and treasurer of the United States 1861-75, resigning in the latter year. Though he had received and disbursed hundreds of millions of dollars, an examination, made at his request when he retired, proved his accounts absolutely correct. His last years were spent near Jacksonville, Fla.

SPINNERET, SPINNING, etc.: see under SPIN.

SPINNING: the art of combining animal and vegetable fibres into continuous threads fit for the processes of weaving, sewing, or rope-making. The most primitive S. apparatus is the spindle and distaff,

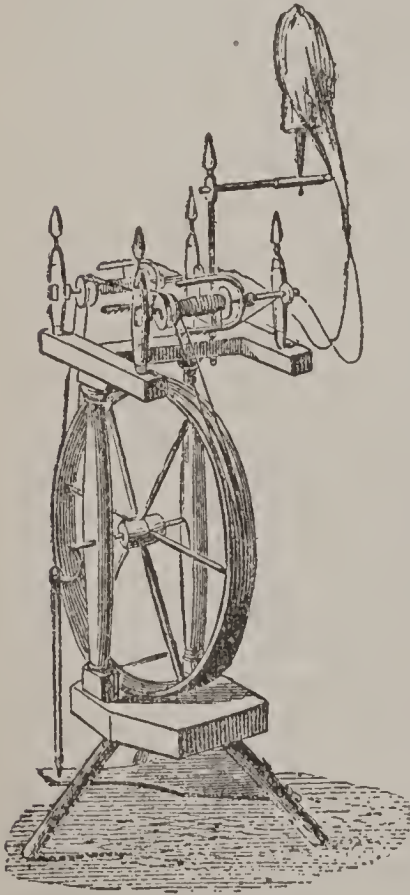


Fig. 1.—Two-handed Spinning-wheel.

representations of which are seen on the earliest Egyptian monuments. The distaff was a stick or staff on which a bundle of the prepared material was loosely bound, and which was held under the left arm or stuck in the belt; the spindle was a smaller tapering piece to which the thread was attached. By a dexterous twirl of the hand, the spindle was made to spin round and at the same time recede from the spinner, who drew out between the fingers of both hands a regular stream of fibres so long as the twisting of the spindle lasted. It was then drawn in, the new length of thread wound upon it, and the operation was renewed. An obvious improvement on this was to set the spindle in a frame and make it revolve by a band passing over a wheel driven either by occasional impetus from the hand or by a treadle; this constituted the *spinning-wheel*, which made its ap-

pearance in Europe in the 14th c., having been already known in India. In the spinning-wheel in its most improved form, and as used for flax, a bobbin or 'pirn,' with a separate motion, was placed on the spindle, which had a bent arm—a flyer or flight—for winding the yarn on the bobbin. The spindle and bobbin revolved at different rates, the revolutions of the spindle giving the twist, and

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the difference of the rate causing the winding on. The two-handed wheel had two spindles and pirns a little apart, with the distaff or 'rock' stuck into the frame between them, and the spinster produced a thread with each hand. The spinning of flax on such wheels for the

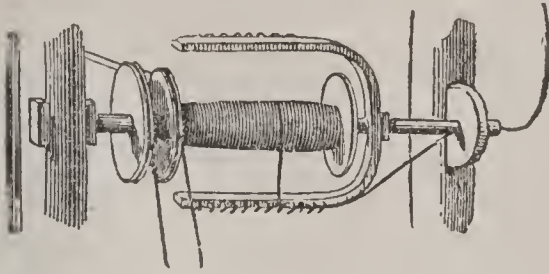


Fig. 2.

Spindle, Bobbin, and Winding-arm on a larger scale.

manufacturer was an important branch of domestic industry as late as 1830, if not later.

Neither the S.-wheel nor the hand could spin more than one or at most two threads at a time; therefore, with the rapid increase of population, and improvements in the process of Weaving (q.v.), they became quite inadequate to

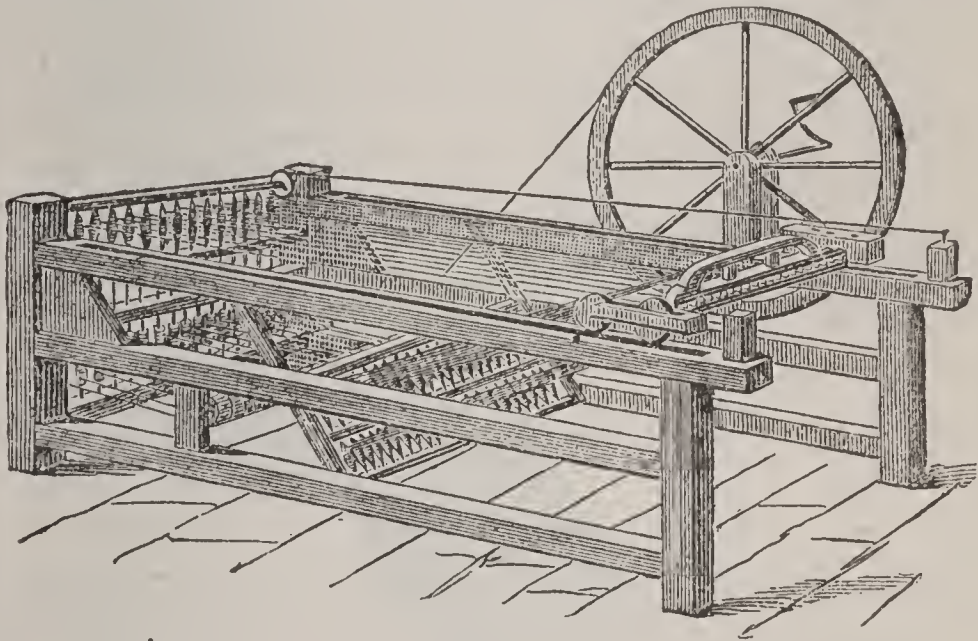


Fig. 3.

supply the demand for yarn: but an accident, it is said, about 1764, led to an invention by which eight threads could be spun at once; and this was soon improved upon until 80 could be produced as easily. This was the invention of the *spinning-jenny* for cotton-spinning, by James Hargreaves (q.v.). In this machine, a number of large reels of cotton formed into a thickish coil, called a *roving*, were set on upright fixed spindles, and the ends of the rovings were passed between two small movable bars of wood placed horizontally and under the control of the spinner, who could thus make them press more or less on the roving, and consequently increase or decrease the draw upon it from the spinning spindles, which were set in a row at

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the other end of the frame, and all capable of being set in motion simultaneously by the wheel. The success of the spinning-jenny (fig. 3) was considerable; but even previous to its invention, a better idea had been started and acted on by others, and was afterward brought to such perfection that the invention of Hargreaves soon passed into obscurity.

To understand the operations of S. as now practiced, and as improved by the invention alluded to, it is desirable to advert to the mode of preparing the fibres for spinning. Though the process is essentially the same for wool and cotton, yet each of these fibres requires special manipulations: the treatment of the raw cotton fibre is as follows: First the cotton has to be 'opened;' that is, it must be relieved from its original knotted and lumpy condition: this was done formerly by hand, but is now easily managed by machines. In the opening-machine, or 'opener,' the raw cotton is spread out on a feeding-table, whence it is taken up by a pair of feeding-rollers, and by them subjected to the action of a 'beater.' The beater is a cylinder bearing at intervals rows of projecting teeth: it has a diameter of 18 in. over the teeth, is on the average 40 in. wide, and makes 1,400 revolutions per minute. A strong draught of air is driven through the cotton while in the opener, which carries away the dust and foreign matter adhering to it. The cotton is carried forward between two perforated zinc or wire cylinders connected with the draught, from which it is taken by a pair of rollers and formed into 'laps.' This operation consists in laying the material very equally on an endless apron made of small bars of wood, and of the width of the frame of the machine in which they are placed. This apron (*a*, fig. 4) passes round two

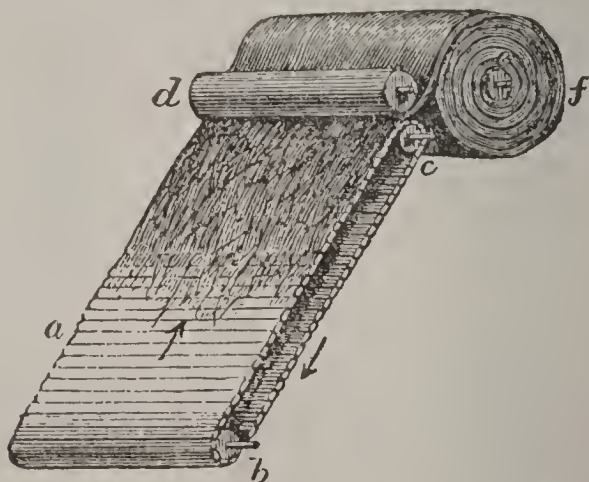


Fig. 4.

rollers a little distance apart, as in fig. 4, *b*, *c*, the rollers being moved by machinery. The arrows indicate the direction in which the apron moves; and as its entire surface receives a thin layer of the fibre, this passes under the roller *d*, and is taken on to the roller *e*, in the form of a compressed layer of cotton or wool, called a *lap*. When the roller *e* is full, it is removed, with its lap *f*, to make way for another. Much care is taken in weighing out and dis-

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tributing the material of these laps, because on this first operation the ultimate size of the yarn depends.

The laps are taken to the *carding-machine*, consisting of a series of cylinders revolving in a frame, and placed so close together that they almost touch each other. Each cylinder is covered with a coating of fine steel wire points,



Fig. 5.

which are struck in leather, or some other flexible material, and are technically called *cards*. The production of these cards by machinery is in itself a marvel, and the automatic machines for making them are wonderfully effective. Each piece of wire is bent as in fig. 5, and is put through two holes in the leather, as in fig. 6; *a* shows a bent wire going in, and *b, b*, wires completely in the holes in leather, *c, c, c*, so as to form two points on the other side, and these are slightly bent all in one direction, as in fig. 7, where the piece of card *a* is seen cut through at *b*, to show the direction given to the wires *c*. There are many variations on this arrangement of the wires, but the general principle is the same in all. The machine for making the cards cuts the wire to the right lengths, bends them, pierces the holes in the leather, inserts the wires, and

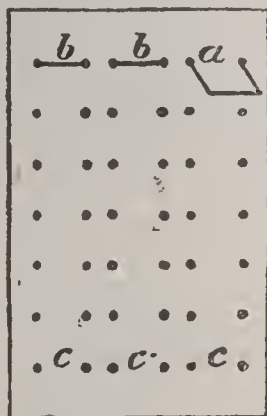


Fig. 6.

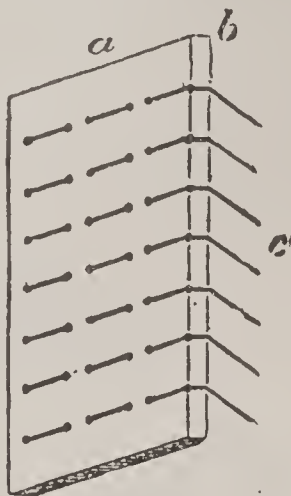


Fig. 7.

finishes by giving them the slight sloping direction which is essential.

The lap is made of the same width as the cylinders of the carding-machine, and is so adjusted that, as it unwinds from its roller, it passes in between a pair of the carding-cylinders, whose steel wire teeth seize the individual fibres, and drag them in one direction until they are caught by other cylinders, and so carried from one to another, always being pulled in a straight direction until they are laid as nearly as possible side by side, and are given off in a thin cobweb-like film at the last cylinder, where the film is prevented from continuing its journey round the cylinders by a small bar of metal called the *doffer*, which, with a gentle and peculiar motion, removes it from the cylinder. The film of fibre is of the same width as the cylinder of the carding-machine, but it is taken from the doffer by means of a vibrating comb, and is drawn together into a funnel,

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which forms it into a narrow web; then passing through two pairs of calender rollers, it is coiled into a deep tin can in the form of a loose untwisted column of cotton or wool, about an inch in thickness, which is called a *sliver*. A small portion of this arrangement is shown in fig. 8, which represents a carding-machine with only two carded cylinders, *a* and *b*; in practice they are much more numerous. There is also a concave piece of carding, *c*, which was formerly much used, but has given way to additional cylinders—but it makes the action more apparent in a drawing; *d* is the lap drawn on by the action of the two small rollers *e, e*, which slightly press it as they revolve. It is quickly distributed all over the surface of the large cylinder *a* by means of its numerous wire-teeth; and as it passes the roller *b*, the teeth of which move in an opposite direction, as indicated by the arrows, the fibres are caught off the large and are carried round the small cylinder until they reach *f*, where they are stripped off by the doffer *g*, and are passed through the ring *h* (a funnel now takes the place of this ring) and the rollers *i, i*, into the tin receiver *k*. The sliver is now in the first stage of spinning; it has next to be drawn out very gradually until it is not thicker than a quill; and in drawing it out, the operator gives it a very slight twist, still leaving it so loose in structure that it will break with a slight touch; in this state it is called a *roving*; and it was at this stage that the spinning-jenny began to operate on it. The rovings, which were wound as they were drawn upon large reels, were unwound by the machine, and were still further drawn out and

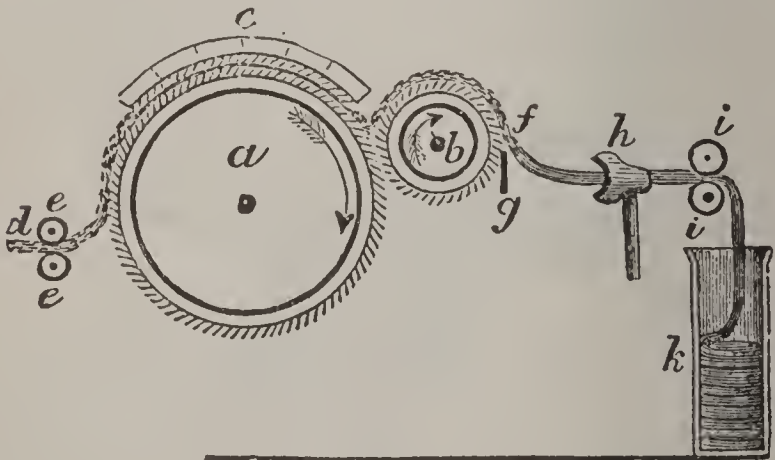


Fig. 8.

firmly twisted and wound on to spindles or cops, the drawing being regulated by the pressure of the wooden bars of the jenny, which was within reach of the operator's hand.

The *throstle-machine*, patented by Arkwright (see ARKWRIGHT, Sir RICHARD) 1769, had for its object the drawing of the rovings through a succession of pairs of rollers, each pair in advance of the others, and moving at different rates of speed. The first pair receive the sliver, compress it, and pass it on to the second pair, which revolve at a greater speed, and thus pull it out to exactly the number

SPINOLA.

of times greater length that their revolutions exceed those of the other pair—in number it is usually eight times—and as the first roving is passed through a second, third, and sometimes fourth machine, the finished roving may be 32 times longer than the sliver. As the roving issues through the last rollers of each machine, it is received on *spools* or *reels*, calculated to hold a given quantity; and these are transferred to the *spinning-frames*, which resemble the *roving-frames*. Here the roving takes the place of the sliver; and as it unwinds from the spool, is drawn through successive pairs of rollers, moving as before at different rates, each succeeding pair faster than the backward ones, so that the roving gets thinner and thinner, until the tenuity is carried as far as desirable. It is then carried on to a spindle which revolves with great rapidity; and by a simple arrangement is made both to twist the thread and to wind it on the spindle ready for the weaver.

This system produces too great a strain on the thread in its progress to admit of its being drawn so fine as is wanted for many purposes; and this led to the invention of the *mule-jenny* by Crompton (q.v.) 1779, which has a travelling frame upon which the spindles are set. This frame is now made long enough to carry hundreds of spindles, and it gently draws out and twists the thread after it leaves the last pair of rollers; and when it has reached its limits—now several yards, but in Crompton's time only five ft.—it rapidly returns, winding up the spun thread on the spindles as it goes back. These machines are now applied, with various necessary modifications, to cotton, wool, flax, silk, and other textile materials; and their effect on manufactures is as wonderful as anything in the whole history of commerce. Previous to the invention of the mule, few spinners could make yarn of 200 hanks to the pound (the hank being always 840 yards): at the same time, the natives of India were weaving yarn of numbers ranging between 300 and 400. Now manufacturers have reached such perfection that Manchester (England) spinners have made No. 700, which was then woven by a French firm. No. 10,000, a pound of which would reach 4,770 miles, has been made as a test of machinery. The most modern machines combine in one the operations of carding, roving, and spinning.

SPINOLA, *spē-nō'lā* or *spē'no-lā*, AMBROGIO, Marchese DI: soldier: about 1571–1630, Sep. 25; b. Genoa; of a noble Italian family. He took service with Spain, and 1603 became chief commander of the Spanish army in the Netherlands. He took Ostend 1604, Jülich 1622, and Breda 1625. He afterward commanded Spanish troops in Italy, and died at the siege of Casale in Piedmont.

SPINOZA.

SPINOZA, *spē-nō'zā*, BARUCH (= *Benedict*); or, as he in later years signed himself, BENEDICT DE SPINOZA: one of the great philosophers of modern times: 1632, Nov. 24—1677, Feb. 21; b. Amsterdam. His parents, rich Portuguese Jews, had their son diligently instructed in the Bible and its commentaries, and the Talmud. But after having mastered both, and imbibed the philosophical spirit of such commentators as Aben Ezra, he was allowed—the more readily that his sickly constitution unfitted him for a commercial career—to give himself to a life of study. Physical sciences and the writings of Descartes (q.v.), to which first of all he turned, soon drew him away from the rigid belief and practices of the synagogue; and Saul Levi Morteira, his talmudical teacher, who had built fond hopes upon the genius of his pupil, was the first to threaten him with dire punishment if he did not retract the rank heresies that he began to utter. S., after a time, entirely withdrew from the outward community of his brethren, who—having in vain endeavored first to bribe him with a pension if he would retain at least an outward conformity to the synagogue worship—formally excommunicated him. A fanatic even attempted to frighten him by a real or feigned attack on him in the street at night. At that period (according to some biographers), the young truth-seeker fell in love with the young and beautiful daughter of Van den Ende, his master in Greek and Latin, but was rejected; from which time Philosophy became the sole object of his life. But chronology takes from this statement all except bare possibility: the girl was not more than 11 or 12 years of age when S. left Amsterdam. In accordance with the excellent Jewish custom, S. had, apart from his studies, made himself master of a mechanical craft: he had learned the art of polishing optical lenses, and this now became the means of his subsistence. He was also an expert in the art of design and of portraiture.

When 28 years old he left Amsterdam, and went to Rhynsburg, near Leyden, where he wrote the *Abridgment of the Meditations of Descartes*, with an Appendix—the latter being a kind of first cast of his *Ethics*. The year following he removed to Woorburg, near the Hague, and soon afterward, yielding to solicitations of his, by this time, numerous friends, he removed to the Hague itself. The elector of the Palatinate, Charles Lewis, next offered him a vacant chair of philosophy at the Univ. of Heidelberg, with full 'liberty of teaching,' provided he would not say aught to prejudice the established creed; but S., foreseeing the probable complications and confusion, declined the lucrative and honorable professorship. His small earnings were enough for his simple wants. In a similar spirit, he refused generous offers by wealthy friends, like Simon de Vries, who proposed to bequeath to S. his estate. S. insisted that the estate should go to the brother and natural heir; and it was so left, with provision for an annuity for S.'s maintenance. The brother proposed 500 florins as the annuity; but S. declined to take more than

300. An offer of a pension, on the condition of his dedicating a work to Louis XIV., he quietly rejected. His domestic accounts, found after his death, show that he preferred living on a few pence a day, to being indebted to another's bounty. Throughout his short life (44 years) of study, of abstemiousness, of bodily and mental suffering—for his constitution was undermined by consumption and overwork, while his sensitive mind was wrought upon by the violent severance of all natural ties of affection, besides frequent obloquy and persecution—no complaint passed his lips. Simplicity and heroic forbearance, with an antique stoicism and a childlike, sympathizing heart, were the principal attributes of him who was vilified as epicurean and atheist by his contemporaries, and whose name bore this stain for a century after his death. It has been said that few men ever were more filled with the spirit of religion than S.; and that to be an epicure at the rate of five cents a day cannot be a very serious transgression.

Respecting S.'s philosophical system, of which only the faintest outline can be given here, it must be premised that it developed itself on the basis of Descartes. The latter had inaugurated a new epoch by his 'reconstruction' of knowledge. Dissatisfied both with the dogma and with the skepticism of the philosophy of his day, he cleared the ground by first doubting everything, and then proceeding to lay a new foundation by his *Cogito, ergo sum* (I think, I therefore exist). S., deeply struck both with the reasonings and conclusions of Descartes, used his 'I think, therefore I exist,' merely as a starting point whence he laid out an altogether different line of thought relative to the Divine existence. Man's consciousness of his own existence and of his imperfect state are not, he thinks, sufficient to solve the grand problem of universal being. He therefore assumes, first of all, as undeniably existing, three fundamental things, which he calls respectively Substance, Attributes, and Mode. By Substance he understands, like Descartes, that which needs nothing else to its existence; but, unlike Descartes, he assumed only One such Substance—the Deity. There is no real difference, he holds, between mind, as represented by God, and matter, as represented by Nature: they are One, and, according to the light under which they are viewed, may be called either God or Nature. The visible world is not distinct from the Deity; it is only His visible manifestation, flowing out of Him who is the ultimate fountain of life and essence, as a finite from the infinite, variety from unity—a unity, however, in which all varieties merge again. Extension and thought, which with Descartes had been two Substances, with S. become 'Attributes'—that which the mind *perceives* as *constituting* Substance. Extension is visible Thought; Thought is invisible Extension. The relation between Substance and Attributes, S. illustrates by the example of an object—colorless in itself—seen through yellow or blue spectacles. And this explains the relation between body and mind, and the complete unity

between them. The mind is the idea of the body—i.e. the same thing considered under the attribute of thought. The *modus* or *accidens* is only the varying form of Substance. Like the curling waves of the ocean, they have no independent existence; nay, less than these are they things of reality; but they are simply the ever-varying shapes of the Substance. Substance, thus, is the only really existing, all-embracing essence, to which belongs everything perceptible to our senses, and not perceptible. Thus, every thought, wish, or feeling is a Mode of God's Attribute of thought; everything visible is a Mode of God's Attribute of extension. God is the 'immanent idea,' the One and All. 'World' does not exist as world—i.e., as an aggregate of single things—but is one complex whole and one peculiar aspect of God's infinite Attribute of extension. The variety that we behold in things is a mere product of our faulty conceptions, particularly of, as S. terms it, our 'imagination,' which perceives unity as a complex of multiplicity.

On these metaphysical speculations he founds his Ethics, which he deduces in mathematical form, after the method of Euclid. The chief doctrines are: The absence of free-will in man—himself only a *Modus* dependent on causes without, and not within him. Will and Liberty belong only to God, who is not limited by any other Substance. Good and Evil are relative notions, and sin is a mere negative; for nothing can be done against God's will, and there is no idea of Evil in Him. Utility alone, in its highest sense, must determine the good and the evil in our mind. Good, or useful, is that which leads us to greater reality, which preserves and exalts our existence. Our real existence is knowledge. Highest knowledge is the knowledge of God. From this arises the highest delight of the spirit. Happiness is not the reward of virtue, but virtue itself, and this is to be attained by a diligent following in God's ways. Sin, evil, negation, etc., are merely things that retard and obstruct this supreme happiness.

S.'s system, Pantheism or Atheism, as it has been variously called, appears to be indeed nothing but the most rigid, most abstract Monotheism that can be conceived by man. There is only Substance, only God—naught else. It was natural that this system should be misunderstood as atheism, or as materialism; inasmuch as the word 'substance,' which, with S., means 'existence,' is, in ordinary language, associated with the idea of matter or body. Be this as it may, 'this most iniquitous and blasphemous human invention,' as it was deemed for 200 years (even Hume casually alluding to the 'hideous hypothesis' of 'this famous atheist'), has become an acknowledged basis of much modern German philosophy; and even devout Christian theologians like Schleiermacher did not hesitate to apply to S. the terms 'pious,' 'virtuous.' Novalis speaks of him as 'that God-intoxicated man.' To S.'s thought God was so great and so real that no room was left for any other existence or any other reality. Much of what claims the name Pantheism is in fact Materialism—a re-

duction of God to Matter, which thus is left as all the God and as all the reality that is: S.'s Pantheism, however unbalanced and unsafe, refined and spiritualized matter until it vanished as a dream—lost in the infinite deep of the Divine Being.

His principal works are: *Renati Descartes Principiorum Philosophiæ, Pars I. et II., more geometrico demonstratæ* (Amsterdam 1663); *Tractatus Theologico-politicus* (anonymous, 1670); the *Opera Posthuma*, edited in the year of S.'s death by Ludwig Meyer, contain: *Ethica Ordine Geometrico Demonstrata, Tractatus Politicus, Tractatus de Intellectus Emendatione, Epistolæ, Compendium Grammatices Linguae Hebræ*. Several minor treatises are lost; but the lately discovered *Tractatus de Deo et Homine*, pub. 1862, is a most valuable addition to our materials for tracing the development of S.'s system. The literature on the Spinozistic philosophy is very copious, especially in Germany. S.'s life has even been made by Auerbach the subject of two romances. There are editions of S.'s works by Paulus (1803), Bruder (1846), Van Vloten and Land (1882). See Pollock's *Spinoza* (1880), and Martineau's (1882).

SPINOZISM, n. *spī-nō'zizm*: doctrinal system of SPINOZA, *spī-nō'zā*, a Dutch Jew, who taught that God is not only the Creator, but also the original matter of the universe; that there can be no substance but God (see SPINOZA, BARUCH). SPINO'ZIST, n. *-zist*, one who believes in the doctrines of Spinoza.

SPINSTER: see under SPIN.

SPINULE, SPINY, etc.: see under SPINE.

SPIRACLE, n. *spī'ră-kl* [L. *spīrac'ŭlum*, an air-hole—from *spīro*, I breathe]: a breathing-pore; a vent; a passage by which air or other fluid is inhaled or exhaled.

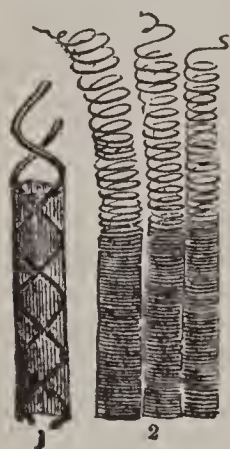
SPIRÆA, n. *spī-rē'ă* [Gr. *speiraia*, a shrubby flower—from *speira*, anything twisted, alluding to the branches being suitable for twisting into garlands]: genus of plants of nat. order *Rosaceæ*, sub-order *Spirææ*, in which the fruit consists of five or fewer capsular carpels. The genus S. has one or more follicular, many-seeded carpels. It contains numerous species, natives of Europe, Asia, and America, herbaceous plants and low deciduous shrubs; of the herbaceous species, are: DROPWORT (*S. Filipendula*), and MEADOW SWEET or QUEEN OF THE MEADOW (*S. Ulmaria*), both cultivated from Europe, and having interruptedly pinnate leaves and flowers in cymes. Dropwort is a native of dry upland pastures; it is tonic and fragrant; and its tubers, somewhat nutritious, are in Sweden ground and made into bread. Meadow Sweet is well known for the powerful fragrance of its flowers. A N. American species (*S. tomentosa*), called HARDHACK in the United States, is used as tonic and astringent. Many of the shrubby species are frequently planted for ornament, such as *S. callosa* and *S. prunifolia* from Japan; *S. bella* from Nepal; *S. chamædrifolia* and *S. trilobata* from Siberia; *S. lanceolata* from China; *S. hypericifolia*, the Italian May

SPIRAL—SPIRAL VESSELS.

or St. Peter's Wreath; *S. ariæfolia* from Oregon; and *S. lobata*, its bruised leaves with the odor of Sweet Birch, from the prairies.

SPIRAL, in Geometry: term denoting a class of curves which, during their gradual regression from a point, wind round it repeatedly. Their equations are generally expressed in terms of polar co-ordinates, and all are necessarily of the form $r = f(\theta)$, where θ never signifies a function of the angle, but the angle itself or a multiple of it. Several such curves have received distinguishing epithets, either on account of the properties that they possess, or from their inventors; the chief of them are—the *equable spiral* or the *spiral of Archimedes*, whose equation is $r = a\theta$, and which, commencing at the origin, circles round and regresses from it with unvarying uniformity; the *hyperbolic* or *reciprocal spiral* ($r\theta = a$); the *logarithmic* or *equiangular spiral* ($r = ab^\theta$); which recedes from the centre or origin with a velocity increasing as the distance, and always cuts the radius vector at the same angle; etc.

SPIRAL VESSELS, in Botany: long and delicate air-tubes in the cellular tissue of plants, which run unbranched through the different parts of the plant, and whose walls are composed of fibres spirally or circularly twined. S. V.



Spiral Vessels.

are either *free*, when their windings are unconnected with each other; or *net-like*, when the windings are involved with each other in a net-like manner. If the free spaces between the convolutions in the latter are linear, they form *lined* vessels; if point-like, they form *punctate* or *porose* vessels. S. V., whose walls are formed of distinct horizontal rings, placed simply one above another, are called *annular* vessels. S. V. seldom occur singly, but are usually united by cells into bundles called vascular bundles. These vascular bundles are scattered in the stems of endogenous

plants; but in the stems of exogenous plants they are arranged in one or more concentric circles. Among cryptogamous plants, the ferns alone (in the most extensive signification of the term) are provided with S. V. All plants which have S. V. are called *Vascular Plants*, in distinction from *Cellular Plants*, whose substance consists of cells only.

The laws by which the spiral form is assumed by S. V. are unknown; though the question has naturally been regarded as having intimate connection with the tendency to spiral structure manifested in plants, and even in some of those cryptogamous plants in which no true spiral vessels are found; a tendency observed not only in spiral stems, spiral tendrils, the spiral fibres of the elaters of *Jungermannia*, and the like, but throughout the vegetable kingdom in the spiral arrangement of leaves and of the organs formed by metamorphosis of leaves. The whole subject remains extremely difficult.

SPIRANT—SPIRE.

SPIRANT, a. *spī'rānt* [L. *spīrans* or *spīran'tem*, breathing—from *spīro*, I breathe]: a name applied to the consonants *y*, *s*, *v*, from their continuous open sounds, and sometimes to *l* and *r*.

SPIRE, n. *spīr* [F. *spire*, a coil or fold—from L. *spīra*, a twist, a wreath—from Gr. *speira*, a coil, a wreath]: anything wreathed or twisted; a spiral; a coil; a curl; a wreath; the whorls of a shell except the lowest. **SPIRY**, a. *spī'ry*, curled; coiled; wreathed. **SPIRAL**, a. *-rāl*, winding like a screw: N. in *geom.*, a curve or curved line receding continually from the centre about which it revolves (see **SPIRAL**, in *Geom.*). **SPIRALLY**, ad. *-lī*.

SPIRE, n. *spīr* [Sw. *spira*, a rod, a pointed steeple: Dan. *spire*, a germ, a sprout: AS. *spīr*, a spike of a reed]: the part of a body tapering to a point; the tapering point of a steeple, rising from the tower: a stalk or blade of grass; the top or uppermost point: V. to shoot up to a point; to sprout. **SPIRING**, imp. **SPIRED**, pp. *spīrd*: **ADJ.** having a spire.—*Spire* in *arch.*, is a very acute pyramid, or sometimes a large pinnacle, constituting the roof of a tower. The history of spires is obscure, but there is no doubt that



1, Turret, St. Peter's Church, Oxford; 2, Turret, Rochester Cathedral; 3, St. Mary's Church, Cheltenham; 4, Bayeux Church, Normandy.

(From Parker's *Glossary of Architecture*.)

the earliest specimens are the pyramidal roofs of the turrets of Norman date. Those of St. Peter's, Oxford, England (fig. 1), and Rochester Cathedral, England (fig. 2), are good specimens of circular and octagonal spires on a small scale. Spires of this early period are much lower than those of later date. The early English style has spires of acute form over the larger towers. They are generally what are termed broach spires, i.e., the slopes spring from the cornice of the tower without any parapet, and at the point where the square changes to the octagon, there is a small set-off or separate roof. (Fig. 3, St. Mary's

SPIRES—SPIRIT.

Cheltenham, England, indicates this arrangement.) Sometimes the angles at top of towers were occupied with pinnacles or sloping masses of masonry, as at Bayeux Cathedral, Normandy (fig. 4).

In the Decorated style, the spires were more enriched, with a parapet and pinnacles at the top of the tower, crochets on the angles, and enriched windows.

The spires of the Perpendicular and Flamboyant styles are still more enriched, with flying buttresses at the angles, etc. They are sometimes perforated, and the sides of the spire filled entirely with tracery. Such spires are common in Germany, those of Strasbourg and Freiburg on the Rhine being very fine examples. As in the later styles generally, the character and beauty of the spire give place to dexterity in masonry, and many examples exist of traceried spires more wonderful than beautiful.—See **GOTHIC ARCHITECTURE**.

Some of the historic spires of English and European churches are of timber, covered with lead in sheets or with shingles; but most of them are of stone.

SPIRES (city): see **SPEIER**.

SPIRILLUM, n. *spī-ril'lŭm*, **SPIRILLA**, n. plu. *spī-ril'lă* [L. *spīra*; Gr. *speira*, a coil, a fold]: a small genus of bacteria, characterized by curved, rod-shaped bodies and, when growing in long filaments, by their twisted or corkscrew-like appearance. Most of them are motile, and many form spores. They mostly inhabit water. The most important disease-producing S. is *Spirillum cholerae*, the cause of cholera. It is very short and but slightly curved; hence the name "comma bacillus" formerly given to this micro-organism. Its native home is in the water and the soil about the delta of the Ganges in India. Another S., *Spirochaete Obermeyerii*, is the cause of relapsing fever. Chicken-cholera is caused by yet another. Spirilla mostly, however, are harmless.—See **BACTERIA**; **GERM THEORY**.

SPIRIT, n. *spīr'it* [L. *spīritus*, breath, the breath of life, a spirit—from *spīro*, I breathe: It. *spirito*: F. *esprit*]: an intelligent being imperceptible to the senses; an immaterial substance; in *popular usage*, the soul of man (see **SOUL**); a spectre or ghost: ardor; courage; temper or disposition of mind; the intellectual powers of man, as distinct from the body; turn of mind; power of mind, moral or intellectual; a man of life, fire, and enterprise; purest part of a body; essential quality; a liquid, as brandy, whisky, or rum, obtained by distilling a fermented vegetable extract (see below): real meaning, as opposed to the *letter*: in *Scrip.*, sometimes the renewed nature of man; the immortal part of man: pre-eminently, the *Holy Spirit* of God: anything eminently pure and refined: V. to convey away rapidly and secretly. **SPIR'ITING**, imp.: N. the service of a spirit—hence, work done well and quickly. **SPIR'ITED**, pp.: **ADJ.** full of animation and life; ardent; vivacious; courageous; in *composition*, denoting the state of the mind, or the character of the disposition, as high-spirited, low-spirited. **SPIR'ITEDLY**, ad. *-ēd-lī*. **SPIR'ITEDNESS**, n. *-nēs*, state of being spirited; animation; dis-

SPIRIT—SPIRITO SANTO.

position of mind. SPIR'ITS, n. plu. -*its*, excitement of mind; natural vivacity: persons distinguished by certain qualities of mind, as, 'the choice and master *spirits* of this age:' fluids containing more than half their bulk of absolute alcohol (see SPIRIT); such alcoholic liquids as are intended for drinking. SPIR'ITIST, n. -*īt-īst* (less properly, SPIRITUALIST), one who believes in intercourse between the living and the dead by sensible tokens. SPIR'ITLESS, a. -*lēś*, lacking in vigor; dull; dejected; having no breath. SPIR'ITLESSLY, ad. -*lī*. SPIR'ITLESSNESS, n. -*nēs*, state of being spiritless; lack of life or vigor. SPIR'ITUOUS, a. -*īt ū-ūs*, containing ardent spirit, or possessing its qualities; light; volatile. SPIR'ITUOUSNESS, n. -*nēs*, quality of being spirituous. SPIR'ITOUS, a. -*ūs*, in *OE.*, refined; resembling spirit. SPIR'ITO'SO, ad. -*īt-ō'zō* [*It.*, spirited]: in *music*, with spirit. SPIRIT-DEALER or -MERCHANT, one who has a license to sell spirituous liquors. SPIRIT-LAMP, lamp in which alcohol is burned instead of oil. SPIRIT-LEVEL, glass tube nearly filled with spirits of wine or distilled water, hermetically sealed, and fixed on a case of wood or other substance, used to ascertain whether a surface be horizontal or perfectly flat. SPIRIT-RAPPER, one who claims to have intercourse with spirits, and who alleges that they manifest their presence and convey intelligence by means of audible raps or knocks. SPIRIT-RAPPING, alleged manifestation of the presence of spirits by audible or visible signs; the belief in such. SPIRIT OF SALT, familiar name for muriatic acid. SPIRITS OF WINE, familiar name for Alcohol (q.v.)—so called because formerly extracted only from wine. ANIMAL SPIRITS, the fluid supposed to circulate through the nerves, and regarded as the agent of sensation and motion; the nervous fluid or nervous principle: briskness or gayety of disposition. THE SPIRIT, the Third Distinction or Subsistence (usually termed Person) in the Holy Trinity. THE SPIRIT, the immortal part of man. RECTIFIED SPIRIT, proof-spirit made purer by further distillation. SPIRITS OF HARTSHORN, impure carbonate of ammonia. SPIRITS OF TURPENTINE, volatile and very inflammable oil distilled from turpentine. To SPIRIT AWAY, to snatch or allure away secretly.—SYN. of 'spirit, n.': life; soul; breath; fire; ardor; enthusiasm; earnestness; courage; animation; vivacity; eagerness; desire; enterprise; cheerfulness; mind; intellect; intent; spectre; ghost; apparition; sentiment; perception;—of 'spirited': animated; lively; vivacious; active; bold; courageous; ardent.

SPIRIT: term of very general application to fluids, mostly of lighter specific character than water, and obtained by distillation; thus, the essential oil of turpentine is called Spirit of Turpentine. In a stricter sense, the term S. is understood to mean Alcohol (q.v.) in its potable condition, whose numerous varieties derive their special characters from the substances used in their production.

SPIRIT DUCK: see GARROT.

SPIRITO SAN'TO: see ESPIRITU SANTO.

SPIRITUAL—SPIRITUALISM.

SPIRITUAL, a. *spīr'it ū-āl* [F. *spirituel*, spiritual—from L. *spirituālis*, spiritual—from *spīritus*, breath, spirit (see **SPIRIT**)]: not material; not gross; possessing the nature or qualities of a spiritual being; not lay or temporal; pertaining to sacred things; pure; holy. **SPIRITUALLY**, ad. *-lī*. **SPIRITUALITY**, n. *-āl'ī-tī* [F. *spiritualité*—from L.]: essence, as distinct from matter; spiritual nature; that which belongs to the church or to religion. **SPIRITUALIZE**, v. *-āl-īz*, to refine; to free from grossness or sensuality; to purify; to convert to a spiritual meaning. **SPIRITUALIZING**, imp. **SPIRITUALIZED**, pp. *-īzd*. **SPIRITUALIZER**, n. *-īzēr*, one who spiritualizes. **SPIRITUALIZATION**, n. *-īzā'shūn*, the act of spiritualizing. **SPIRITUALISM**, n. *-īzm*, in *philos.*, the system which teaches that all that is real is spirit, soul, or self; that system which regards the external world as either a succession of notions impressed on the mind by the Deity, or else the mere educt of the mind itself: philosophic system opposed to **MATERIALISM** (q.v.—also the references there given): also the belief in the frequent communications from the world of departed spirits, as manifested by visible or audible signs; spirit-rapping and the many allied manifestations (in this sense, more properly **SPIRITISM**). **SPIRITUALIST**, n. *-īst*, one who professes regard for spiritual things only, or a belief in them; the opposite of *materialist*: also one who believes in direct intercourse with departed spirits (in this sense, more properly **SPIRITIST**). **SPIRITUALISTIC**, a. *-īs'tīk*, relating to spiritualism in philosophy. **SPIRITUALNESS**, n. *-nēs*, the state or quality of being spiritual. **SPIRITUALTY**, n. *-īt-ū-āl-tī*, in *OE.*, the ecclesiastical body; the whole clergy of the church. **SPIRITUAL COURT**, an ecclesiastical court. **SPIRITUAL-MINDEDNESS**, the state of having devout and holy affections.

SPIRITUALISM, or **SPIRITISM**, *spīr'it-īzm*: belief in intercourse with disembodied spirits through the agency of persons having peculiar susceptibilities, called mediums: also the theories and practice developed from such belief. (For the philosophic system known as Spiritualism, the opposite of Materialism, see **MATERIALISM**.) The belief in occasional intercourse with departed spirits is probably as old as the belief in human immortality, and seems to have permeated the religions of all nations in all ages. A well authenticated case in England is from the pen of the Rev. Joseph Glanvil, chaplain-in-ordinary to King Charles II. of England, who reports that a house was for two years (1661–63) visited by a spirit, or spirits, who beat tattoos on the roof and sides of the house, caused chairs and tables to move around the rooms, and made other noisy demonstrations: it is notable that he states also that the unseen visitants made answer by knocks—the first recorded instance of such communication of intelligence. A well authenticated case similar to the above is the mysterious disturbance at the parsonage of the Rev. Samuel Wesley, father of John Wesley, at Epworth, as recorded by Adam Clark, LL.D., F.A.S., in *Memoirs of the Wesley Family*. He states that for two months (1716, Dec.—1717, Jan.) unaccountable phenomena were witnessed by all the household.

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and by a number of neighbors and clergymen invited by Mr. Wesley to investigate them. These disturbances were loud knockings, opening and closing of doors, sounds as of footsteps going up and down stairs, the turning of a hand-mill in the attic, groans, and other noises so boisterous as to prevent the family from sleeping. Thrice was Mr. Wesley pushed by an invisible force; and a large mastiff belonging to the family is said to have indicated the approach of the disturbance by various signs of fear. There are many cases of this kind reported during the 18th c. and later, but in all these cases the disturbances ceased as suddenly and unexpectedly as they had begun. In this country, similar phenomena, utterly inexplicable, but authenticated by many witnesses of the highest credibility and intelligence, occurred in the parsonage of the Rev. Dr. Phelps, minister of the First Church, Stratford, Conn.—a widely-known divine, father of Prof. Austin Phelps, D.D., of Andover Theol. Seminary.

The modern revival of S. as a system developing intelligible communication, originated in the little village of Hydeville, Wayne co., N. Y., in the family of John D. Fox, who, 1848, Dec., began to hear knockings in the house, which toward the end of March increased in loudness and frequency. These knocks seemed connected with the two children, Margaret and Kate, aged 12 and 9 years respectively; or as Margaret declared (1888) 8 and 6½ years respectively; and the mother's attention being attracted by what seemed significance, or intelligent responsiveness in the knockings, she asked questions which were promptly answered by raps. These manifestations continued, occasioning much excitement in the village. The sounds were more marked in the presence of Kate Fox, and she was taken to Rochester to the house of her married sister, Mrs. Fish. Thither the rappings followed her; and a code of signals was soon developed, in which one rap meant 'no,' three raps 'yes,' and two raps indefinite. Various other modes were devised for receiving messages; especially calling out or pointing to the letters of the alphabet in succession, raps occurring when the letters required to spell out the message were reached. Similar demonstrations soon began in other households in Rochester; 'spirit circles' were formed, and other mediums were discovered, who developed phenomena of various kinds. Investigating committees were unable to discover the cause, though the mediums were subjected to every test that ingenuity could invent. Reports of these occurrences spread with great rapidity; and mediums were developed and circles for investigation were formed in numerous places; and not only were the rappings obtained, but new phenomena were developed. These were of various kinds—some of them similar to those long observed under Animal Magnetism (see, as to France, the correspondence of Billault and Deleuze, 2 vols. 1836): see HYPNOTISM: TRANCE. In *Forty Years of American Life*, by Thomas Low Nichols, M.D., the following are among the assertions made: 'Dials were made with movable hands, which pointed out letters and

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answered questions without apparent human aid. The hands of mediums, acting convulsively, and as they averred, without their volition, wrote things apparently beyond their knowledge, in documents purporting to be signed by departed spirits: their writings were sometimes made upside down, or reversed so as to be read only through the paper or in a mirror. Some mediums wrote with both hands at a time, different messages, *without*, as they said, being conscious of either. There were speaking mediums, who declared themselves merely passive instruments of the spirits. Some represented, faithfully, it was said, the actions, voices, and appearance of persons long dead; others, blindfolded, drew portraits, said to be likenesses of deceased persons whom they had never seen—the ordinary work of hours being done in a few minutes. Ponderous bodies, as heavy dining-tables and pianofortes, were raised from the floor: tables on which several persons were seated were raised into the air by some invisible force. Mediums are said to have been raised into the air, and floated about above the heads of the spectators. Persons were touched by invisible, and sometimes by visible hands. Various musical instruments were played upon without visible agency. Strange feats of legerdemain, as the untying of complicated rope-knottings in an incredibly short time, astonished many.' These feats of untying rope-knottings were exhibited by the Davenport brothers throughout the country. Their detection and exposure, which were claimed and published after some years, have not been acknowledged by them, and are not accepted as genuine by spiritualists.

Many theories were invented to explain these phenomena, but no sooner was a theory invented for one class of facts, than another class sprang up for which it was inadequate. Not only did the flame spread, but sometimes the extinguishers caught fire, and obdurate materialists came to a belief in a future life for man, being moved by the experimental evidence supplied by so-called spirit manifestations. Prof. Robert Hare (q.v.), perhaps the most eminent chemist and physicist of his time in the United States, instituted a series of experiments intended to prove that the phenomena were wholly due to natural causes: and the public, and men of science in particular, were surprised when instead, there appeared his large work, *Spiritualism Scientifically Demonstrated*; with diagrams of ingenious apparatus invented by him to test the genuineness of some classes of the phenomena. The Hon. John W. Edmonds, judge in the court of appeals of N. Y., brought to bear on the subject a mind trained by judicial experience and careful sifting of evidence. He investigated with many different mediums, and took notes as carefully as though in court: to his astonishment he found that he was himself a medium, and under the title *Spiritualism*, he published two large volumes, narrating his investigations, visions, and spiritual communications. His daughter Laura also became a medium; and under some foreign influence would

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sometimes answer freely in languages with which in her normal state she was unacquainted.

In England, reports of these marvels were generally received with ridicule and contempt. The visit to London of Mrs. Hayden, American medium, 1852, first excited public interest in spiritualism. Among those convinced by her was Robert Owen (q.v.), founder of English Socialism, whose son Robert Dale Owen also became a believer. In 1855 a more remarkable medium arrived in England, Daniel Douglas Home (q.v.). The manifestations which occurred in his presence were soon the subject of newspaper controversy. A full account of Home's strange experiences is in his autobiography, *Incidents in My Life*. In 1869, Jan., the London Dialectical Soc. appointed a committee 'to investigate the phenomena alleged to be spiritual manifestations, and to report thereon.' The evidence thus collected was presented 1871, July, in their report, with minutes, etc.—a vol. of 412 large octavo pages.—The committee presented evidence of facts, but offered no explanation.

Among notable scientific investigators of S. is William Crookes, F.R.S., discoverer of the mental thallium, editor of the *Chemical News* and of the *Quarterly Journal of Science*. In the latter journal, 1874, Jan., is his article 'Notes of an Inquiry into the Phenomena called Spiritual, 1870-73.' He attests phenomena similar to those affirmed by the Dialectical Society's committee and its witnesses, which came under his notice in his own house, in the light, and with only private friends present except the medium, at times appointed by himself, and under circumstances which, he says, absolutely precluded instrumental aids. Another distinguished leader in natural science, Alfred Russel Wallace (q.v.), also is a believer in the facts of S. and of mediumship.

One of the phases of S. is 'spirit photographs.' On clean and previously unused plates, marked by the sitter, and even when the sitter has used his own plates and camera, there is stated to have appeared with the sitter a second figure; such figures in many instances have been recognized as portraits of deceased relatives and friends. They have been obtained by many photographers, professional and amateur, in the United States, England, and on the continent of Europe.

In accounting for the strange phenomena of S., the theory which would first naturally suggest itself is that of jugglery, conjuring, fraud; or that of delusion without intent to deceive; but in face of the mass and character of the evidence presented, these hypotheses are absolutely untenable as accounting for all the proved facts. It is indeed certain that a large proportion of the phenomena may be, and that many have been, traced to imposture; moreover, regarding the small or large genuine remainder of them, the question is open whether they are due to disembodied spirits, or to some other force as yet unknown; but, however this *remainder* is to be accounted for, it must be by something else than imposture or delusion. A multitude of mediums have been proved

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to be impostors, and have been exposed by scientific investigators and by spiritualists themselves. Even recognized mediums, in whose presence some phases of the phenomena have been honestly produced, have been detected in attempting to imitate the more remarkable phenomena beyond their scope but produced in the presence of other mediums. A fact remarkable in the history of S. is the confession by one of the Fox sisters (Mrs. Margaret [Fox] Kane), more than 40 years after the unaccountable events at Hydeville and Rochester, that those manifestations were produced by her and her sister Kate in the mischievous waywardness of childhood, by trick and device; and that their persistence in the fraud was due to an older sister. Her confession was published in the *New York World*, 1888, Aug. 21; and her sister Kate has publicly expressed her acceptance of this confession as her own. The two sisters have also shown to public assemblies how their spirit-rapping was done. On due consideration, however, this confession—whether little weight be attached to it, or even great weight as concerns the rappings through the agency of the two sisters—yet, in candid judgment, leaves untouched the wide range and great variety of phenomena later developed which exist as facts for thorough investigation. No explanation of the trick for producing some of the first Rochester raps is adequate as explanation for the many complex phases which have since arisen and for which there exists credible evidence. Much argument against S. is based on the asserted injurious tendency of some of its modern developments: this department in the discussion is open for both sides. Moreover, while it is only reasonable to refuse to accept the spiritual origin of any given communication without full proof, there seems an inconsistency when a believer in any of the world's great religions distinctly denies as a general principle the *possibility* of any such communication; inasmuch as all these religions either declare or imply such communication as, at various times, a fact. The value of any such proved communication is, of course, open to debate.

Many investigators of the genuine phenomena in their higher phases are seeking explanation for them in connection with the demonstrated marvels of hypnotism and 'animal magnetism,' and of those recently developed under what is called 'mental suggestion' the data in these departments of psychology, though already numerous, are not yet either analyzed or classified adequately for definite conclusions in this direction. Meanwhile, the suggestion presents itself to some students, that—inasmuch as man, scientific man, has yet some things to learn about himself and the universe of matter and spirit—one of the unexplored regions now opening to investigation may comprise materials for one or even more new sciences. Of these sciences, one may be the modes and laws of the influence which one mind or spirit may exert on, or may receive from, another; while another science may concern that 'borderland' of the interaction between the spiritual

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and the material forces in man's being and in the sphere in which man's life is cast

See *Researches in the Phenomena*, by Crookes (1874); *From Matter to Spirit*, by Mrs. De Morgan, preface by Prof. De Morgan; *The Two Worlds*, by Thomas Brevior; *Footfalls on the Boundary of Another World*, and *The Debatable Land*, by Robert Dale Owen; *History of the Supernatural*, by William Howitt; *A Defense of Spiritualism*, by Alfred Russel Wallace; *Lights and Shadows of Spiritualism*, by D. D. Home (1877); *Report of the London Dialectical Soc. on Spiritualism* (1871); General Reports of the London Soc. for Psychical Research; *Nature's Divine Revelations*, by Andrew Jackson Davis (New York 1847—a notable book): also for philosophical discussion, *Mesmerism, Spiritualism, etc., Historically and Scientifically Considered*, by W. B. Carpenter, F.R.S. (1877); Prof. Zöllner's *Transcendental Physics* (translated 1880); Dr. J. Ochorowicz, in *Mental Suggestion* (New York 1891).

Spiritualism has scarcely taken a definite systematic development: its numerous adherents are to some extent organized, but are not bound by any formal statement of doctrine. Its believers in the United States are estimated at four or five millions, besides very many who, accepting its main facts and some of its elementary principles, remain in various denominational connections or outside of all churches. The spiritualists of the United States in their 5th national convention at Rochester, N. Y., 1868, Aug. 26–28, organized the American Association of Spiritualists; and embodied what they deemed the essential truths of S. in the following 'Resolutions.'—1. That man has a spiritual nature as well as a corporeal; in other words, that the real man is a spirit, which spirit has an organized form, composed of spiritual substance, with parts and organs corresponding to those of the corporeal body. 2. That man, as a spirit, is immortal, and has continued identity. Being found to survive that change called physical death, it may be reasonably supposed that he will survive all future vicissitudes. 3. That there is a spirit-world, with its substantial realities, objective as well as subjective. 4. That the process of physical death in no way essentially transforms the mental constitution or the moral character of those who experience it. 5. That happiness or suffering in the spirit-world, as in this, depends not on arbitrary decree, or special provision, but on character, aspirations, and degree of harmonization, or of personal conformity to universal and divine law. 6. Hence, that the experiences and attainments of this life lay the foundation on which the next commences. 7. That since growth is the law of the human being in the present life, and since the process called death is in fact but a birth into another condition of life, retaining all the advantages gained in the experiences of this life, it may be inferred that growth, development, or progression is the endless destiny of the human spirit. 8. That the spirit-world is near or around, and interblended with our present state of existence; and hence that we are constantly under the cognizance and influence of

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spiritual beings. 9. That as individuals are passing from the earthly to the spirit-world in all stages of mental and moral growth, that world includes all grades of character from the lowest to the highest. 10. That since happiness and misery depend on internal states rather than on external surroundings, there must be as many grades of each in the spirit-world as there are shades of character—each gravitating to his own place by the natural law of affinity. 11. That communications from the spirit-world, whether by mental impression, inspiration, or any other mode of transmission, are not necessarily infallible truths, but on the contrary partake unavoidably of the imperfections of the minds from which they emanate, and of the channels through which they come, and are, moreover, liable to misinterpretation by those to whom they are addressed. 12. Hence, that no inspired communication, in this or any past age (whatever claims may be or have been set up as to its source), is authoritative any further than it expresses truth to the individual consciousness, which last is the final standard to which all inspired or spiritual teachings must be brought for test. 13. That inspiration, or the influx of ideas and promptings from the spirit-world, is not a miracle of a past age, but a perpetual fact, the ceaseless method of the divine economy for human elevation. 14. That all angelic and all demoniac beings which have manifested themselves, or interposed in human affairs, in the past, were simply disembodied human spirits, or beings of like character and origin, in different grades of advancement. 15. That all authentic miracles (so called) in the past, such as the raising of the apparently dead, the healing of the sick by the laying on of hands or other simple means, power over deadly poisons, the movement of physical objects without visible instrumentality, etc. have been produced in harmony with universal laws, and hence may be repeated at any time under suitable conditions. 16. That the causes of all phenomena—the sources of all power, life, and intelligence—are to be sought for in the internal or spiritual realm, not in the external or material. 17. That the chain of causation, traced backward from what we see in nature and in man, leads inevitably to a Creative Spirit, who must be not only a *fount of life* (love), but a *forming principle* (wisdom)—thus sustaining the dual parental relations of Father and Mother to all individualized intelligence, who, consequently, are all brethren. 18. That man, as the offspring of this Infinite Parent, is in some sense His image or finite embodiment; and that, by virtue of this parentage, each human being is, or has, in his inmost nature, a germ of divinity—an incorruptible off-shoot of the divine essence, which is ever prompting to good and right. 19. That all evil in man is inharmony with this divine principle; and hence whatever prompts and aids man to bring his external nature into subjection to, and harmony with, the divine in him—in whatever religious system or formula it may be embodied—is a ‘means of salvation’ from evil. 20. That the hearty and intelligent conviction of these truths, with a realiza-

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tion of spirit-communion, tends—1st. To enkindle lofty desires and spiritual aspirations, an effect opposite to that of materialism, which limits existence to the present life. 2d. To deliver from painful fears of death, and dread of imaginary evils consequent thereupon, as well as to prevent inordinate sorrow and mourning for deceased friends. 3d. To give a rational and inviting conception of the after-life to those who use the present worthily. 4th. To stimulate to the highest possible uses of the present life, in view of its momentous relations to the future. 5th. To energize the soul in all that is good and elevating, and to restrain from all that is evil and impure. This must result, according to the laws of moral influence, from a knowledge of the constant pressure or cognizance of the loved and the pure. 6th. To promote our earnest endeavors, by purity of life, by unselfishness, and by loftiness of aspiration, to live constantly *en rapport* with the higher conditions of spirit-life and thought. 7th. To stimulate the mind to the largest investigation and the freest thought on all subjects, especially on the vital themes of spiritual philosophy and duty, that we may be qualified to judge for ourselves what is right and true. 8th. To deliver from all bondage to authority, whether vested in creed, book, or church, except that of received truth. 9th. To cultivate self-reliance and careful investigation by taking away the support of authorities; and leaving each mind to exercise its own truth determining powers. 10th. To quicken all philanthropic impulses, stimulating to enlightened and unselfish labors for universal human good, under the encouraging assurance that the redeemed and exalted spirits of our race, instead of retiring to idle away an eternity of inglorious ease, are encompassing us about as a great cloud of witnesses, inspiring us to the work, and aiding it forward to a certain and glorious issue.

The growth of spiritism on both sides of the Atlantic has been extensive. In recent years it has had large growth through its camp-meetings. In many states there are camp-meeting grounds where its adherents and mediums assemble once a year. Many thousand people visit these camps to witness the phenomena there produced. Among the latest manifestations are the almost instantaneous oil-paintings on slates, as produced at Cassadaga, N. Y., 1891, Aug.; writing inside of sealed envelopes; and the receiving of communications between two slates that are closed together. The most popular and noted camp-meetings are at Lake Pleasant, Mass.; Onset, Mass.; Cassadaga, N. Y.; and Lookout Mountain, Tenn. Lake Pleasant has perhaps the largest attendance, 10 to 15 thousand. Cassadaga has about 200 cottages, and a summer-school. There are about 30 minor camps. Seven periodicals in the interest of S. are published in this country; and there are periodicals in England, France, Germany, Italy, and S. America.

SPIRITUS ASPER—SPIT.

SPIRITUS ASPER, n. *spîr'î-tûs äs'pér* [L. *spîritus*, a breathing; *asper*, rough]: in *Gr. gram.*, a mark thus (') placed before certain words beginning with a vowel, to indicate that such should be pronounced like words beginning with a vocal *h* in Eng.; also placed over Gr. *ρ*, Eng. *r*. **SPIR'ITUS LENIS**, n. *lē'nîs* [L. *lenîs*, soft]: the mark (') denoting the soft breathing.

SPIRKET, n. *spêr'kêt* [etym. doubt.]: large wooden peg: in *ship-build.*, a space fore and aft between floor-timbers or futtocks of a ship's frame; distance between rungs.

SPIROID, n. *spîr'oyd* [Gr. *speira*, a coil, a fold; *eidos*, resemblance]: resembling a spiral. **SPIROIDEA**, n. plu. *spîr-oy'dê-ä*, spiral vessels: see under **SPIRE 2**. **SPIROLOBÆ**, n. plu. *spîr'ô-lô'bê-ê* [Gr. *lobos*, a lobe]: in *bot.*, Cruciferae which have the cotyledons folded transversely and the radicle dorsal.

SPIROMETER, n. *spî-rôm'ê-têr* [L. *spîro*, I breathe: Gr. *metron*, a measure]: an instr. for measuring the quantity of air an individual can expire after a forced inspiration.

SPIROPTERA, n. plu. *spî-rôp'têr-ä* [L. *spîra*, a coil, a convolution; Gr. *pterôn*, a wing]: a genus of intestinal parasites whose species are found in various animals.

SPIRT, v. *spêrt* [Bav. *sprutzen*, to sprinkle: Sw. *spruta*, to spirt (see **SPURT**)]: to throw out in a jet or stream, as a liquid; to gush out in a small stream, as a liquid from a cask; to spurt: N. a sudden rushing of a liquid substance from a small tube or orifice; a jet. **SPIRT'ING**, imp. **SPIRT'ED**, pp. **SPIRTLE**, v. *spêrt'l*. **SPIRT'LING**, imp. *-lîng*. **SPIRT'LED**, pp. *-ld*, in the same sense.

SPIRULA, *spîr'û-la*: genus of the family *Spirulidæ*, belonging to the ten-armed division of the two-gilled order of Cephalopods, the highest of mollusks. The small, spiral, chambered shell is internal. The living animal is rarely obtained, inhabiting the warmer seas, but the shells are scattered by thousands on some of the E. India coasts, and occasionally carried by the Gulf Stream to the shores of Europe. The animal has an oblong body, with small terminal fins; arms with 6 rows of minute cups; and long tentacles. There are several species. A disk at the hind extremity of the body, perhaps adhesive and indicating a sedentary habit, is possessed by no other known cephalopod. The U. S. coast-survey steamer dredged a living S. from a depth of 950 fathoms, 1878. In 1879 Prof. Owen showed that the shell is not wholly internal, is the fulcrum of muscles of the funnel, head, and arms, and contains part of the liver in its last chamber. If, as some think, the ammonites were dibranchiate, the S. may be the last and interesting vestige of that extinct family.

SPIRY: see under **SPIRE 2**.

SPIT, n. *spît* [AS. *spitu*; Dut. *spit*; Dan. *spîd*, a spit: Icel. *spita*, a peg, a skewer: Sw. *speta*, a little rod: Ger. *spiess*, a spear, a spit]: a long thin bar of wood or metal, pointed at one or both ends, on which meat, etc., is roasted; a small point of land running into the sea, or a long narrow

SPIT—SPITHEAD.

shoal from the shore into the sea, as a *spit* of sand: V. to put on a spit: to thrust through, as meat by a spit; to pierce. SPITTING, imp. SPIT'TED, pp.

SPIT, v. *spīt* [AS. *spittan*, *spætan*; Icel. *spyta*; Dan. *spytte*; Ger. *spützen*; L. *sputārē*, *spuērē*, to spit]: to throw out, as saliva from the mouth; to eject from the mouth; to rain slightly: N. spittle; saliva. SPAT, pt. *spīt*, did spit. SPITTEN, pp. *spīt'tn*, or SPIT, pp. *spīt*. SPITTLE, n. *spīt tl*, saliva; the moisture thrown out from the mouth. SPIT'TOON, n. *spīt tōn'*, a shallow box to receive the spittle thrown out of the mouth. SPITFIRE, n. *fīr*, a violent passionate person. To SPIT UPON, to insult grossly; to treat with contempt.

SPITAL, or SPITTLE, n. *spīt'tl* [a corruption of HOSPITAL, which see: comp. Norw. *spedalsk*, a leper]: in *OE.*, originally a lazaret-house or house for lepers; subsequently applied to a *hospital* or almshouse of any kind; a name designating many places in Eng. and Scot. from the fact of the existence in them of lazaret-houses or hospitals.

SPITALFIELDS. *spīt'al-fēldz*: district of London, adjoining Bethnal Green; named from the *Hospital* of St. Mary, founded there 1197 by Walter Brune and his wife Rosia. The dist. is inhabited chiefly by silk-weavers and other poor people. The manufacture of silk was established in S. by emigrants from France, after revocation of the Edict of Nantes.

SPITCH COCK, v. *spīch'kōk* [Eng. *spit*, and *cook*]: to dress an eel with condiments, etc., after splitting it longwise, then broiling it: N. an eel so dressed and cooked. SPITCH-COCKED, a. *-kōkt*, split and cooked, as an eel.

SPITE, n. *spīt* [Dut. *spijt*; Low Ger. *spiet*, vexation: Dan. *spydig*, sharp, caustic; Gael. *spiod*, malice: Ger. *spitzig*, pointed, satirical: perhaps a mere abbreviation of DESPITE]: sudden or fitful ill-will; hatred or great irritation accompanied with the desire to annoy or injure: V. to treat maliciously; to do with a desire to vex or annoy; to annoy; to thwart. SPITTING, imp. SPIT'TED, pp. SPITEFUL, a. *-fūl*, having a desire to annoy or injure; malignant. SPITEFULLY, ad. *-lī*. SPITEFULNESS, n. *-nēs*, the state or quality of being spiteful; malice. IN SPITE OF [for *in despite of*]: in defiance of; notwithstanding. To OWE A SPITE, to entertain a grudge against.—SYN. of 'spite, n.': rancor; malevolence; pique; grudge; vexation; chagrin; hatred; malice; malignity.

SPITHEAD, *spīt hēd*: notable roadstead on the s. coast of England, favorite rendezvous of the British navy; 14 m. long by about 4 m. in average breadth; named from the 'Spit,' a sand-bank stretching s. from the English shore for 3 m. S. is the e. division—the Solent (q.v.) being the w. division—of the strait which separates the Isle of Wight from the mainland. It is protected from all winds, except those from the s.e., and its noted security caused sailors to give it the appellation the 'king's bedchamber.'

SPITHEAD FORTS.—For these important defenses, £2,000,000 was assigned 1859; embracing in their scope

SPITTLE—SPITZ-DOG.

Portsmouth with its great arsenal and dock-yard Spithead, and the neighboring coast. The plans have been changed from time to time. The foundations of four principal forts were begun 1864: they consisted of rings of stone-work, laid on the levelled bed of the shoal, tapering a little upward from a width of 54 ft. to one of 43 ft.; the outer diameter of the ring gradually lessening from 231 to 213 ft. From 20 to 15 ft. of submarine masonry was required. Outside the rings of stone are layers of rubble, to protect the stone-work from tidal action. The forts are in the form of a granite core, surrounded by a great thickness of iron plates. Above each fort are revolving turrets carrying 35-ton guns, which throw shells of 700 lbs. There is also an inner line of forts.

SPITTLE: see SPITAL. SPITTLE-HOUSE, in *OE.*, a house for lepers; a lazar-house.

SPITTLE, SPITTOON: see under SPIT 2.

SPITZBERGEN, *spīts-bèrg'èn*: group of islands in the Arctic Ocean; lat. $76^{\circ} 30'$ — $80^{\circ} 40'$ n., long. 9° — 22° e.; 300 m. n. of Scandinavia, and 325 e. of Greenland. The group is composed of three large and several small islands; area estimated about 30,000 sq. m. The largest of the group, *Spitzbergen Proper*, consists of two oblong and parallel tracts known as West S. and East S., Stans Foreland, or New Friesland, connected by a neck of land; the whole strongly resembling a boat-hook in shape. The next two in size are *Northeast Land*, and *King Charles Land*—sometimes known as *Egede Land*. Being far within the Arctic circle, and surrounded by a wide expanse of sea, almost the whole surface is covered with perpetual snow and glaciers. The whole w. side is mountainous, its general elevation 3,000—4,500 ft. above sea-level; and the same is true of the n.e. coast. During ten months of the year, mercury freezes, and for the other two months the temperature is seldom more than 5° above the freezing-point; yet, during this short summer, more than 100 species of plants, which constitute the vegetation of this inhospitable region, succeed in springing up, and producing and ripening their seed. The whole of S. could scarcely afford sustenance for a human being; nevertheless it is a haunt of reindeer, foxes, and bears; and whales and seals abound on the coasts. S. has from time to time been occupied by Dutch and Russian colonies, who were supplied from the mainland of Europe. It was discovered, 1596, by William Barentz, the Dutch explorer, in his third voyage to discover the Northeast Passage. It is claimed by Russia.

SPITZ-DOG, *spīts*: small race of the Pomeranian dog (n. Prussia), with pointed nose, erect ears, long hair, and bushy tail. The color is usually white or pale yellowish; rarely black. It has been a favorite pet; but, except sometimes as a watch-dog, it has lost favor on account of its snappishness and its reported liability to hydrophobia. It is mentioned by Darwin as readily crossing with foxes, and is believed to be a cross between the white fox and some of the wolf-dogs semi-domesticated in the arctic regions.

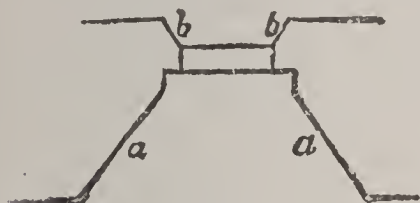
SPLANCHNIC—SPLEEN.

SPLANCHNIC, a. *splāngk'nĭk* [Gr. *splangchnon*, an entrail]: in *anat.*, belonging to the viscera or intestines. **SPLANCH'NICA**, n. plu. *-nĭ-kă*, medicines for the bowels; diseases affecting the bowels. **SPLANCH'NO-**, *-nō*, in *anat.*, a prefix, implying relation to viscera, as **SPLANCHNO-SKEL-ETON**, the osseous structure of particular organs. **SPLANCH-NOGRAPHY**, n. *splāngk-nōg'ră-fĭ* [Gr. *graphō*, I write]: an anatomical description of the viscera. **SPLANCHNOL'OGY**, n. *-nōl'ōjĭ* [Gr. *logos*, discourse]: a description of the viscera; the doctrine of diseases of the internal parts.

SPLASH, n. *splāsh* [Sw. *plaska*, to paddle or dabble; Dan. *pladske*, to splash; Gael. *splaidse*, to fall with a noise, to squash]: water or slush thrown upon anything, particularly from a puddle; a noise, as from water thrown up: V. to bespatter with water or mud, or the like; to strike or dash about water or slush. **SPLASH'ING**, imp. **SPLASHED**, pp. *splāsh't*. **SPLASHY**, a. *splāsh'ĭ*, wet and muddy; full of muddy or dirty water. **SPLASH-BOARD**, a board in front of a vehicle to prevent the mud in wet weather being scattered upon it. **SPLASHERS**, n. plu. *-ērz*, guards placed over the wheels of a locomotive engine; the same contrivances placed over the wheels of an ordinary carriage drawn by horses.

SPLATTER, v. *splăt'tēr*: another spelling of **SPLUTTER**, which see. **SPLITTER-SPLATTER**, n. *splĭt'tēr-splăt'tēr*, splashy dirt, expressive of the sound made by dashing water. **SPLATTERDASHES**, or **SPATTERDASHES**, coverings for the legs to keep off the splashes of mud.

SPLAY, a. *splā* [an abbreviation of **DISPLAY**]: broad; turned outward: N. in *arch.*, the slanting or bevelled expansion given to the sides of doors or windows, divergence outward from the vertical line; also the corner taken off the outer angle of such openings as at *b, b*: V. to slope or slant;



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to render oblique. **SPLAY'ING**, imp. **SPLAYED**, pp. *splād*. **SPLAY-FOOT**, a foot having the plantar surface flattened instead of concave; flat foot. **SPLAY-FOOTED**, a. having a splay-foot. **SPLAY-MOUTH**, a wide mouth; a mouth widened in derision.

SPLEEN, n. *splēn* [Gr. and L. *splēn*, the milt or spleen]: the milt; a spongy viscus, related to the lymphatic system, near the large extremity of the stomach, formerly supposed to be the seat of melancholy, anger, or vexation (see below): ill-humor; a fit of anger; latent spite; melancholy: in *OE.*, immoderate merriment; a caprice; instability of temper. **SPLEENED**, a. *splēnd*, deprived of the spleen. **SPLEEN'-FUL**, a. *-fŭl*, angry; peevish. **SPLEEN'ISH**, a. *-ĭsh*, affected with spleen. **SPLEEN'ISHLY**, ad. *-lĭ*. **SPLEEN'ISHNESS**, n. *-nēs*, the state of being spleenish. **SPLEEN'Y**, a. *-ĭ*, angry; peevish. **SPLEENWORT**, the name of many ferns of the genus *Asplenium* (q.v.).—**SYN.** of 'spleen': caprice; inconstancy; spite; anger.

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SPLEEN: largest and most important of the so-called ductless glands; whose chief object is supposed to be to restore to the circulation any needful substances that may have been withdrawn from it. It is of oblong flattened form, soft, of very brittle consistence, highly vascular, of dark bluish-red color, and situated in the left hypochondriac region, with its interior slightly concave surface embracing the cardiac end of the stomach and the tail of the pancreas (see PANCREAS). It is invested by an external or serous coat, derived from the peritoneum, and an internal fibrous elastic coat. The size and weight of this organ are liable to extreme variations at different periods of life, in different individuals, and in the same individual under different conditions. In the *adult*, in whom it attains its greatest size, it is usually about five inches in length, three or four in breadth, and an inch or an inch and a half in thickness, and weighs about seven ounces. At *birth*, its weight in proportion to that of the entire body is as 1 to 350, which is nearly the same ratio as in the adult; while in *old age* the organ decreases in weight, the ratio being as 1 to 700. The size of the S. is increased during and after digestion, and is large in highly fed, and small in starved, animals. In intermittent fevers and leucocythemia, it is much enlarged, weighing occasionally 18 to 20 lbs., and constituting what is popularly known as the *ague-cake*.

On cutting into the S., a section of it shows numerous small fibrous bands termed *trabeculae*, united at numerous points with one another, and running in all directions. The parenchyma, or proper substance of the S., occupies the interspaces of the above-described areolar framework, and is a soft pulpy mass of dark reddish-brown color, consisting of colorless and colored elements. The *colorless elements* consist of granular matter, of nuclei about the size of the red blood-disks, and a few nucleated vesicles: they constitute one-half or two-thirds of the whole substance of the pulp in well-nourished animals, while they diminish in number, and sometimes altogether disappear in starved animals. The *colored elements* consist of red blood-disks and of colored corpuscles either free or included in cells; sometimes enlarged blood-disks are seen included in a cell, but more frequently the inclosed disks are altered in form and color, as if undergoing retrograde metamorphoses. Besides these, numerous deep-red, or reddish-yellow, or black corpuscles and crystals, closely allied to the hematin, of the blood, are seen diffused through the pulp substance.

The venous blood of the S. is carried away by the splenic vein, which contributes to form the great portal venous system, distributed through the liver; while arterial blood is supplied by the splenic artery, the largest branch of the coeliac axis. The branches of this artery subdivide and ramify like branches of a tree, with the *Malpighian* or *splenic corpuscles* attached to them like fruit. These splenic corpuscles, discovered by Malpighi (q.v.), are whitish spherical bodies, either connected with the smaller arterial branches by short pedicles, or sessile on their

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sheaths. They vary considerably in size and number, their diameter usually ranging from one-third to one-sixth of a line. Each consists of a membranous capsule, homogeneous in structure, formed by prolongation from the sheath of the artery. The blood-vessels ramifying on the surface of a corpuscle consist of the larger branches of the artery with which it is connected, of venous branches, and of a delicate capillary plexus. From this arrangement of the vessels, it may be inferred that active changes are carried on in the contents of these corpuscles, which consist of a soft, white, semi-fluid substance, made up of granular matter, nuclei similar to those found in the pulp, and a few nucleated cells. These splenic corpuscles are much more distinct in early life than subsequently, and are much smaller in man than in most mammals. They, however, bear a remarkable relation to the general state of nutrition, being much the greatest in well-fed animals, especially in the early periods of the digestion of albuminous food; while they diminish extremely in ill-fed animals, and in those that have been starved they disappear.

The chemical composition of the S. confirms the view that a retrograde change of tissue occurs very freely in it. In 1,000 parts, there were found (by Oidtmann) nearly 250 of solid residue, of which more than 243 were organic, consisting of albumen, fats, inosite, uric acid, sarcine, xanthine, leucine, tyrosine, and pigment; all of which, except the first two, are products of metamorphosis of tissue. This gland contains also a large quantity of oxide of iron, obtained probably from the disintegration of red blood-disks in it.

As to its uses, it may be regarded as a store-house of nutritive material, to be drawn upon according to the requirements of the system; and that it exerts assimilative action on the albuminous matter, during its withdrawal from the general current of the circulation, we have direct evidence in the much greater proportion of fibrin in its venous blood—the blood of the splenic vein sometimes containing nearly six times the usual quantity of fibrin. Before the chemical investigations which led to the above conclusion, it was held that the function of the S. was to act as a reservoir for the portal blood, with the view of preventing the portal vessels from being unduly distended during the digestive process. To what extent it is the seat of the disintegration of old blood-corpuscles, and of the formation of new ones, is uncertain. The removal of the S. from the body has frequently been performed in animals without serious effects; but in some of these cases small secondary spleens are developed; and in others, various sets of lymphatic glands are observed to increase rapidly, shortly after the operation, and these probably act vicariously for the spleen. Its singular and complicated microscopic structure, and its extreme vascularity, lead to the inference that this is a highly important viscus.

Diseases of the S. occur mostly as secondary in the course of other affections; e.g., in Intermittent Fever (Ague) and Leucocythemia (q.v.), when it is sometimes

SPLENCULUS—SPLENT.

enlarged to 40 times its natural weight. It is sometimes diminished to the size of a walnut, the cause of this atrophy being unknown, but the apparent result being a loss of color, and a comparatively bloodless condition. The S. is liable also to the singular morbid change known as *Waxy Degeneration* (q.v.), in which the presence of starch-like amyloid granules is observed in the tissue under microscopico-chemical investigation. These remarkable granules dissolve when heated in water, and by the action of iodine acquire a bluish tint.

SPLENCULUS, n. *splĕn'kū-lūs*, **SPLENCULI**, n. plu. *splĕn'kū-lī* [dim. of L. *splĕn*, the milt or spleen]: in *anat.*, small detached roundish nodules, occasionally found in the neighborhood of the spleen, and similar to it in substance; supplementary spleens.

SPLENDENT, a. *splĕn'dĕnt* [L. *splendens* or *splenden'tem*, shining; *splendĕrĕ*, to shine: It. *splendente*, splendid, bright]: shining; glossy; beaming; illustrious.

SPLENDID, a. *splĕn'dĭd* [F. *splendide*—from L. *splendidus*, bright, shining—from *splendĕrĕ*, to shine: It. *splendidō*]: very bright; showy; magnificent; glittering; brilliant: heroic; famous. **SPLEN'DIDLY**, ad. -lĭ.

SPLENDOR, n. *splĕn'dĕr* [F. *splendeur*—from L. *splendor*, brightness—from *splendĕrĕ*, to shine: It. *splendore*]: great brightness; brilliance; magnificent display; grandeur; eminence.—**SYN.**: brilliancy; lustre; magnificence; showiness; parade; pomp; gorgeousness; display.

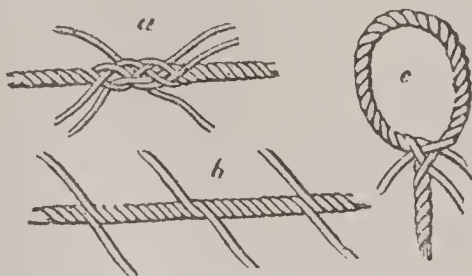
SPLENETIC, a. *splĕ-nĕt'ĭk* or *splĕn'ĕ-tĭk* [L. *splĕnĕtĭcus*, splenetic—from Gr. and L. *splĕn*, the milt or spleen: It. *splenetico*, splenetic]: troubled with spleen; fretful; peevish; gloomy: N. a person affected with spleen. **SPLENET'ICAL**, a. -ĭ-kāl, same as **SPLENETIC**. **SPLENET'ICALLY**, ad. -lĭ. **SPLENIC**, a. *splĕn'ĭk* [L. *splĕnĭcus*]: belonging to the spleen. **SPLENIC FEVER**, or **SPLENIC APOPLEXY**, disease of cattle and sheep, due to a bacillus in the blood; anthrax (see **CATTLE-PLAGUE**: **BACILLUS**: **GERM-THEORY**). **SPLENITIS**, n. *splĕ-nĭ'tĭs*, inflammation of the spleen. **SPLENIZATION**, n. *splĕ'nĭ-zā'shŭn*, a change produced in the lungs by inflammation, so that they resemble the substance of the spleen. **SPLENITIVE**, a. *splĕn'ĭ-tĭv*, in *OE.*, passionate; hot; fiery.—**SYN.** of 'splenetic, a.': peevish; sullen; fretful; gloomy; morose.

SPLENIAL, a. *splĕ'nĭ-āl* [L. *splĕnĭum*, a patch, a splint]: in *anat.*, applied to a bone of the skull in certain vertebrata; denoting an osseous plate connected with the mandible of fishes, reptiles, etc.

SPLENT: see **SPLINT**.

SPLICE—SPLINT.

SPLICE, v. *splis* [O. Dut. *splissen*; Sw. *splissa*; Dan. *splidse*; Ger. *splissen*, to join together so that the two ends shall interlace or overlap]: to unite or join together the two ends of a rope by interlacing or twisting together the strands; to connect pieces of wood or metal, as beams or

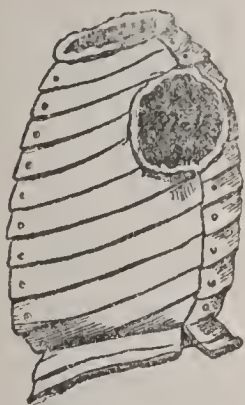


Splices of Ropes:

a, short splice; *b*, long splice; *c*, eye-splice.

railway-bars, by means of overlapping parts fastened or bolted to them: N. a piece added to a rope by splicing. **SPLI'CING**, imp. **SPLICED**, pp. *splīst*. To **SPLICE THE MAIN BRACE**, in *naval phrase*, to give out an extra allowance of spirits after special exposure to cold or wet. To **GET SPLICED**, in *common slang*, to get married.

SPLINT, n. *splīnt*, or **SPLENT**, n. *splēnt* [a nasalized form of **SPLIT**: Dan. *splint*, a splinter: Dut. *splinter*, a splinter]: a small piece split off from a larger: in *surg.*, thin piece of wood used to confine in its proper position a broken bone after being set (see below): hard excrescence growing on the shank-bone of a horse (see below): hard laminated coal, intermediate between cannel and common pit coal: V. to confine or supply with splints. **SPLINT'ING**, imp. **SPLINT'ED**, pp. **SPLINTS**, n. plu. thin strips of wood used for lighting candles, gas, etc. **SPLINT ARMOR**, a kind of armor consisting of overlapping plates. **SPLINT-BONE**, the fibula; in some animals, as in the horse, the small metacarpal bones (see **SPLINT-BONES**). **SPLINTER**, n. *splīnt'ēr*, a small piece split off a larger; an irregular fragment rent from a body: V. to shiver; to break or rend into thin small fragments. **SPLINT'ERING**, imp. **SPLINT'ERED**, pp. *-ērd*: **ADJ.** broken into fragments. **SPLINT'ERY**, a. *-ēr-ī*, consisting of or resembling splinters; having splinters or scales adhering, as



Splint Armor for
Back and Breast.
1570.

in a fracture. **SPLINTER-BAR**, the cross-bar of a coach which supports the springs. **SPLINTER-PROOF**, capable of resisting the fragments or splinters of bursting shells.

SPLINT, or **SPLENT**: bony enlargement on a horse's leg, between the knee and fetlock, appearing usually on the inside of one or both forelegs, frequently between the large and small canon bones; resulting from concussion, and most frequent in young horses that have been rattled rapidly along hard roads before their bones are consolidated.

SPLINT-BONES—SPLINTS.

When of recent and rapid growth, the S. is hot and tender, and causes lameness, noticeable especially when the horse is trotted on a hard road. A piece of spongiopiline saturated with cold water should be applied to the S., kept in position with a light linen bandage, and wetted with cold water or a refrigerant mixture every hour. Perfect rest must be secured for ten days or a fortnight. When the limb is cool, and free from tenderness, the swelling, which will remain, may be greatly reduced by some stimulating applications, e.g., the ointment of the red iodide of mercury, the common fly-blister, or the firing-iron.

SPLINT'-BONES: in the horse and certain allied mammals, the small metacarpal bones. These animals have what is popularly known as an outer and an inner splint-bone in the skeleton of the leg. Beyond the bones of the carpus and tarsus, there is one very large bone (the metacarpal or metatarsal of the third toe), which supports the whole weight of the animal. On either side of this bone are the outer and inner splint-bones, which are small bones, not running more than half the length of the great central bone into which they merge. They represent, in rudimentary form, the metacarpal and metatarsal bones of the fourth and second toe.

SPLINTS, in Surgery: mechanical contrivances for keeping a fractured limb in its proper position, and for preventing motion of the fractured ends; used also for securing perfect immobility of the parts to which they are applied in other cases, as in diseased joints, after resection of joints, etc.

Ordinary S. are of wood carved to the shape of the limb, and padded; the best pads being old blankets, cut into strips long and wide enough to line the S., and laid in sufficient number upon one another to give requisite softness. The S. should be firmly bound to the previously bandaged limb with pieces of bandage, or with straps and buckles; care being taken that they are put on sufficiently tight to keep the parts immovable, and to prevent muscular spasm, but not so tight as to induce discomfort. Gutta-percha, sole-leather, or pasteboard, after having been softened in boiling water, may in some cases advantageously take the place of wooden S.: they must be applied when soft to the part needing support, so as to take a perfect mold; and must then be dried, stiffened, and, if necessary, lined. Some complicated kinds of splint are required in certain cases: see any illustrated catalogue of surgical instruments.

The ordinary splint is now largely superseded by immovable bandages, which consist of the ordinary bandage saturated with a thick mucilage of starch, or with a strong solution of a mixture of powdered gum arabic and precipitated chalk, which, when dry, form a remarkably light but firm support: as, however, these bandages require some hours to dry and become rigid, means must be used to prevent displacement of the limb in the interval. On this account, many surgeons prefer the plaster of Paris or gypsum bandage, which is applied in the following

SPLIT—SPODUMENE.

manner: the limb being protected by a layer of cotton-wool, a bandage of coarse and open material, into which as much dry powdered gypsum as possible has been rubbed, must be immersed in water for about a minute, and then rolled like an ordinary bandage spirally around the limb: after every second or third turn of the bandage, the left hand of the surgeon should be plunged into water, and smeared over the part last applied. When the whole has been thus treated, the exterior of the bandage should be smeared over with a paste of gypsum and water until a smooth surface and complete rigidity have been attained—a process not occupying more than 10 or 15 minutes. In a case of simple fracture, where no surgical aid is at hand, any non-professional person of ordinary intelligence might apply this bandage, extreme care first being taken that the ends of the broken bone are in their proper position.

SPLIT, v. *splīt* [Dut. *splijten*; Ger. *spleissen*, to split: Low Ger. *splittern*, to shiver to pieces: Dan. *splitte*, to split]: to divide or separate lengthwise; to rive; to rend; to divide, as into parties; to be thrown into discord, as a party; to burst or part asunder; to be broken, as a ship: N. a rent; a crack; a fissure or crack lengthwise; a breach or division in a party. **SPLIT'TING**, imp.: N. act of one who splits or divides. **SPLIT**, pt. and pp. *splīt*. **SPLIT'TER**, n. *-tēr*, one who splits: V. same as **SPLUTTER**, which see. **SPLIT'TERING**, imp. **SPLIT'TERED**, pp. *-tērd*. **SPLIT-PEAS**, peas deprived of their husks and split, used for making soup. **SPLITTER-SPLATTER**, a phrase imitative of dashing and plashing. To **SPLIT ONE'S SIDES WITH LAUGHTER**, to laugh excessively under strong excitement; to burst with laughter. **HAIR-SPLITTING**: see under **HAIR**.

SPLÜGEN, *splü'ghen*: mountain of the Lepontine Alps, in the Grisons, Switzerland, whose summit, the Tomben-horn, is 9,600 ft. high. The pass of the S., connecting s.e. Switzerland with the region of Italy round Lake Como, is at its highest point 6,940 ft. above sea-level, and in its present condition is the work of the Austrian govt. (1823). The s. or Italian descent has three great 'galleries'—i.e., covered portions of the pass constructed of solid masonry, for protection from avalanches: they are the longest on any Alpine high-road.

SPLUTTER, v. *splūt'tēr* [Low Ger. *splittern*, to shiver to pieces: Sw. *splittra*, to shiver: Low Ger. *sprutten*, to spout, to spurt]: to scatter about confusedly and noisily; to scatter about drops of saliva while speaking; to scatter drops about the paper in writing with a bad pen; to speak hastily and confusedly: N. a muddle, as by scattering water; bustle; stir; tumult. **SPLUT'TERING**, imp. **SPLUT'TERED**, pp. *-tērd*.

SPODOMANCY, n. *spōd'ō-măn'sī* [Gr. *spodos*, ashes; *manteia*, divination]: divination by means of ashes.

SPODUMENE, n. *spōd'ũ-mēn* [Gr. *spodos*, ashes]: a silicate of alumina and lithia of a pale grayish-green color.

SPOFFORD—SPOHR.

SPOFFORD, *spŏf'ĕrd*, AINSWORTH RAND, LL.D.: librarian: b. Gilmanton, N. H., 1825, Sep. 12. He received a classical education; removed to Cincinnati and engaged in book publishing and selling; was associate editor of the Cincinnati *Daily Commercial* 1859-61; and was then appointed first asst. librarian in the library of congress. He was promoted librarian-in chief 1864, and held the office until 1897. He received the degree LL.D. from Amherst College 1884. He has published several catalogues of the library; numerous historical, literary, and economic articles; and *The American Almanac* (annual, 1878-89); *The Library of Choice Literature*, 10 vols. (1881-88); *The Library of Wit and Humor*, 5 vols. (1884); and *A Practical Manual of Parliamentary Rules* (1884).

SPOFFORD, HARRIET E. (PRESCOTT): author: b. Calais, Me., 1835, Apr. 3. She has spent most of her life in Newburyport, Mass. About 1850 she began writing for Boston story-papers. In 1859 she contributed to the *Atlantic Monthly* the story *In a Cellar*, which gave her reputation, and she has since been a constant writer for the best periodicals. Her style is vivid and imaginative. Her works include *The Amber Gods* (1863); *Azarian* (1864); *New England Legends* (1871); *The Thief in the Night* (1872); *Art Decoration applied to Furniture* (1881); *Marquis of Carabas* (1882); *Poems* (1882); *Hester Stanley at St. Mark's* (1883); *The Servant-girl Question* (1884); and *Ballads about Authors* (1888).

SPOHR, *spŏr*, LUDWIG, or LOUIS: German musical composer and violinist: 1784, Apr. 25—1859, Oct. 16; b. Brunswick; son of a physician. He began his violin-studies in boyhood; at the age of 12 he played a violin concerto of his own at the court of Brunswick; at 13 he obtained appointment as chamber-musician to the duke. A few years later he made a musical tour through Russia and Germany, giving concerts, and acquiring high reputation as a performer on the violin. In 1804 he became music director at the court of Saxe-Gotha, and held afterward for several years the office of music director of the Theater an der Wien at Vienna. He visited Italy 1817, Paris 1819; and in 1820 appeared in London, where he was received with great applause at the Philharmonic Society's concerts, and produced two symphonies and an overture. In 1823 he became Kapellmeister at the court of Hesse-Cassel, which post he held till 1857, when he retired from professional life. S. had a surprisingly fertile imagination. His musical works include eight operas—*Faust*, *Jessonda*, *Zemira und Azor*, *Der Zweikampf der Geliebten*, *Der Berggeist*, *Pietro von Albano*, *Der Alchemist*, and *Die Kreuzfahrer*; three oratorios—*Die letzten Dinge*; *Des Heilands letzte Stunden*, and *Der Fall Babylons*; various masses, psalms, and hymns, six grand symphonies, four overtures; besides nonettes, quartettes, violin concertos, sonatas for violin and harp, fantasias, and rondos. *Die letzten Dinge*, or Last Judgment, is a very grand and very attractive oratorio; so also is *Der Fall Babylons*. Of his operas, the most esteemed are *Faust* and *Jessonda*, the latter remark-

SPOIL—SPOKANE

able for successful embodiment of the spirit of oriental poetry. His songs are deficient in broad and decided melody; but his instrumental works occupy a very high place in the estimation of musicians, especially the C minor symphony, and the symphony known as *Die Weihe der Töne*. As a violinist, S.'s purity of tone and high finish have never been surpassed, and his *Violinschule* is the best and most complete work on violin-playing ever written.—See *The Autobiography of L. Spohr*, translated from the German (Lond. 1864).

SPOIL, n. *spoyl* [F. *spolier*, to plunder—from L. *spoli-ārē*, to deprive of covering, to plunder—from *spolium*, the spoil of an animal—that is, its skin stripped off: comp. Gael. *spial*, to pluck, to snatch away]: that which is taken by force, especially in war; pillage; robbery; plunder; the goods plundered; cast-off skin of a serpent: V. to take away by force; to strip of goods; to plunder; to rob; to practice robbery. **SPOIL'ING**, imp. **SPOILED**, pp. *spoyld*. **SPOIL'ER**, n. *-ēr*, one who spoils or plunders; plunderer; pillager; robber. **SPOIL'FUL**, a. *-fūl*, in *OE.*, rapacious.

SPOIL, v. *spoyl* [a broad pronunciation of *spill*, to shed liquids, and, hence, to waste: Ger. *spülen*; Sw. *spola*, to wash or rinse]: to waste; to render useless; to mar; to taint; to go to ruin; to decay; to injure character by over-indulgence: N. in *OE.*, corruption; ruin. **SPOIL'ING**, imp. **SPOILED**, pp. *spoyld*, or **SPOILT**, pt. *spoylt*: **ADJ.** rendered useless; wasted; over-indulged. **SPOIL'ER**, n. *-ēr*, one who mars or corrupts. **SPOIL'FUL**, a. in *OE.*, wasteful. **SPOILSPORT**, one who mars; one who renders useless.

SPOKANE, *spō'kān*: city, the capital of Spokane co., Wash.; on both sides of the Spokane river; on the Ida. div. of the Northern Pacific railroad, and terminus of the Spokane and Northern, the Seattle Lake Shore and Eastern, and several minor railroads, and of the Oregon Railway and Navigation Company's line; about 270 m. e. of Puget Sound (at Seattle). It is in a rich timber and agricultural country; has a most picturesque location; and derives an enormous and constant water power from the falls (150 ft. in $\frac{1}{2}$ m.) of the river, which never freezes. In its immediate vicinity are highly productive gold, silver, and lead mines, and granite and marble quarries. The city has electric, cable, and steam-motor street railroads aggregating 15 m., and horse railroads extending nearly 25 m.; 15 hotels, 2 col., 20 churches, and 16 public school buildings. There were (1902, Mar.) '4 national banks, (cap. \$750,000); 3 state banks; and 1 sav. bank (cap. \$50,000); opera-house (\$300,000, capacity 1,500 people); 3 theatres (since fire); 2 daily and 5 weekly newspapers; 5 flour mills, 12 saw-mills; 11 iron-foundries, 4 sash and door and 4 furniture factories, all run by water power. The city has the Holly water-works system and electric plants for street railroads and lighting. S. was visited by a fire 1889, Aug. 4, which destroyed property of \$14,000,000 estimated value, but proved a local benefit in wiping out the rude wooden buildings common to al-

SPOKE—SPONDIAS.

young cities in the west. There is a military post, Fort Spokane. Pop. (1880) 350; (1890) 19,922; (1901) 36,848.

SPOKE, n. *spōk* [from **SPIKE**, which see: Ger. *speiche*, Dut. *speek*, the spoke of a wheel]: one of the bars of a wheel passing from the nave or centre to the felly or rim; the spar or round of a ladder. **SPOKE SHAVE**, a kind of plane used for dressing curved wood-work. **TO PUT A SPOKE IN HIS WHEEL**, to impede; to thwart a plan; to hinder any one or do him damage—in allusion to the pin or spoke put into moving wheels of machinery to lock them, or into the wheel of a conveyance to cause it to stop or to slide along.

SPOKE, pt. *spōk*, or **SPOKEN**, pp. *spō'kn*: from **SPEAK**, which see. **SPOKESMAN**, n. *spōks'măn*, one who speaks for one or more persons.

SPOLETO, *spō-lā'tō* (Latin, *Spoletium*): city of central Italy, province of Perugia, on a rocky hill, 61 m. n.e. of Rome. It is commanded by a citadel, on a separate hill, divided from that on which the town stands by a deep gorge, crossed at an immense height by a bridge and aqueduct. The streets are steep, narrow, and dirty. S. has a fine cathedral built in the time of the Lombard dukes, and containing many interesting works of art. The churches of St. Domenico, San Giovanni, the collegiate church of San Pietro, and the palace of the ancient dukes of S., are notable.—The ancient *Spoletium* had its origin in a Roman colony about B.C. 240; and during the second Punic war, Hannibal is said to have been repulsed by the colonists in an assault which he made on the town B.C. 217, after the battle of Trasimene. Under the Lombard dukes, it became cap. of an independent duchy. In 1860, it was taken by the Italians from a body of Irish volunteers in the service of the pope. S. contains many interesting Roman remains, also a ruin which has the name Palace of Theodoric. There are manufactures of woollens and hats. Pop. about 8,000.

SPOLIATE, v. *spō'li-āt* [L. *spoliātus*, robbed, plundered—from *spoliārē*, to rob (see **SPOIL** 1)]: to pillage; to plunder; to rob. **SPO'LIATING**, imp. **SPO'LIATED**, pp. **SPO'LIA'TION**, n. *-ā'shŭn*, the act of plundering or robbery. **SPO'LIA'TIVE**, a. *-tīv*, tending to deprive or diminish. **SPO'LIA'TOR**, n. *-tēr*, one who spoliates. **SPO'LIA'TORY**, a. *-tēr-ĭ*, tending to spoil; destructive.

SPONDEE, n. *spōn'dē* [L. *spondēus*, a spondee: Gr. *spondeĩ'ōs*, a spondee; as an adj., of or belonging to libations—from *spondai*, a solemn treaty, plu. of *spondē*, a libation, referring to its prolonged solemn character]: a poetic foot consisting of two long syllables. **SPONDAIC**, a. *spōn-dā'ĭk*, pertaining to a spondee.

SPON'DIAS: see **HOG PLUM**,

SPONGE—SPONGES.

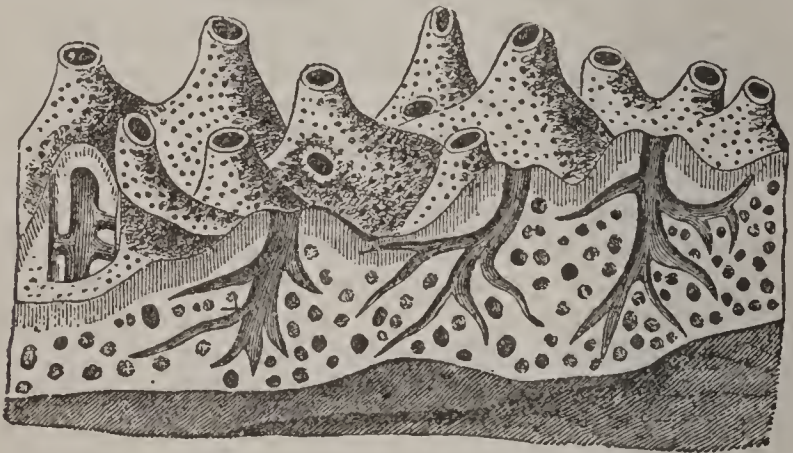
SPONGE, n. *spŭnj* [OF. *esponge*—from L. *spongĭa*; Gr. *spongġia*, a sponge: F. *éponge*]: porous substance much used for domestic purposes, being the skeleton of simply organized marine animals (see SPONGES): soft porous substance for cleaning and wiping, etc.: one who pertinaciously lives upon others: bakers' dough before it is finally kneaded and shaped to be baked into the loaf: V. to wipe or cleanse with a sponge; to wipe out completely; to imbibe or suck in; to gain by mean arts; to harass by extortion; to hang on others for a maintenance. **SPONG'ING**, imp.: N. the act of wiping with a sponge; the act of living meanly upon others. **SPONGED**, pp. *spŭnjd*. **SPONGER**, n. *spŭnj'ēr*, one who sponges; a hanger-on for maintenance, etc. **SPONG'Y**, a. -*ĭ*, soft, open, and porous; full of small cavities; having the quality of imbibing moisture readily. **SPONGINESS**, n. -*ĭ-nēs*, state of being soft and porous. **SPONG'IFORM**, a. -*fawrm* [L. *forma*, shape]: like a sponge; soft and porous. **SPONGIDA**, n. plu *spŭnj'ĭ-dă*, the class of animals called sponges. **SPONGE-CAKE**, a light sweet cake. **SPONGING-HOUSE**, a prison-officer's house in which debtors committed to his custody were formerly lodged. **TO SPONGE ON**, to harass by overtaxing hospitality. **TO SET A SPONGE**, to mix a mass of flour with yeast, and set it in a position favorable for fermenting. **TO THROW UP THE SPONGE**, to yield the contest; to give up the struggle; a familiar slang phrase derived from the practice of *throwing up* one of the *sponges* that had been employed to wipe the blood from a combatant's face during a prize-fight, in token that he yielded.

SPONGES: organisms, formerly classed with Protozoa, now constituting a sub-kingdom, since it was discovered that they propagate by ova. There are a few small groups in which the skeleton, whether horny, or siliceous, or calcareous, is absent: they are known as *Myxospongiæ* [Gr. *muxa*, mucus]; the other S. are distinguished as *Fibro-spongiæ*, *Calci-spongiæ* and *Silici-spongiæ* accordingly as their skeleton consists of *spongin*, of limestone, or of silex. But this classification, though it may facilitate a general understanding of the nature and economy of the sponges, is quite inadequate for the purposes of the student of natural history. *Spongin* is a horny substance, in its chemical composition resembling silk. Like the material of the calcareous and siliceous skeleton it sometimes occurs in the form of spicules, but usually it is fibrous (as in the common sponge), consisting of a central core of soft granular substance, around which are concentric layers of spongin, forming a hollow cylinder. There are forms intermediate between the horny, the siliceous, and the calcareous skeleton, on one side, and the myxospongiæ skeleton on the other, as where the *scleres* or skeletal parts are simply scattered continuously through the mesoderm or middle layer of tissue between the ectoderm and the endoderm. In the calcareous and siliceous S., limestone and silex take the place of spongin. The mineral matter occurs in spicules: these are not purely mineral, but contain a trace of organic matter. They are most beautiful microscopic objects; and spicules

SPONGES.

of different forms are sometimes found in the same species, sometimes lying close together in bundles, sometimes straight or slightly curved, sometimes in the shape of needles pointed at one end, or at both; sometimes of needles radiating from a centre; while some have a head at one end, like a pin, some have grapnel-like hooks at the ends. Some of the species with horny frame-work have spicules imbedded in it; some have them implanted in the fibres; some are destitute of them. There is a beautiful W. Indian species, *Dictyocalyx pumiceus*, in which the siliceous matter becomes itself a fibrous network, and is so fine and transparent as to resemble spun glass. In a living state, many S. exhibit colors from the presence of coloring matter. The siliceous fibres of the Glass-rope S. of the China seas resemble long white horse-hair. The Venus Flower-basket S. of the same waters is shaped like a cornucopia, and made up of glassy fibres interwoven like a cane chair-seat. Akin to it probably are curious fossils, *Dictyophyton*, of the Chemung group of N. Y., until recently regarded as algæ.

Like any of the higher animals, the body of the sponge is composed of a distinct outer layer of cells, the ectoderm or epidermis, and a ciliated inner layer or endoderm (often



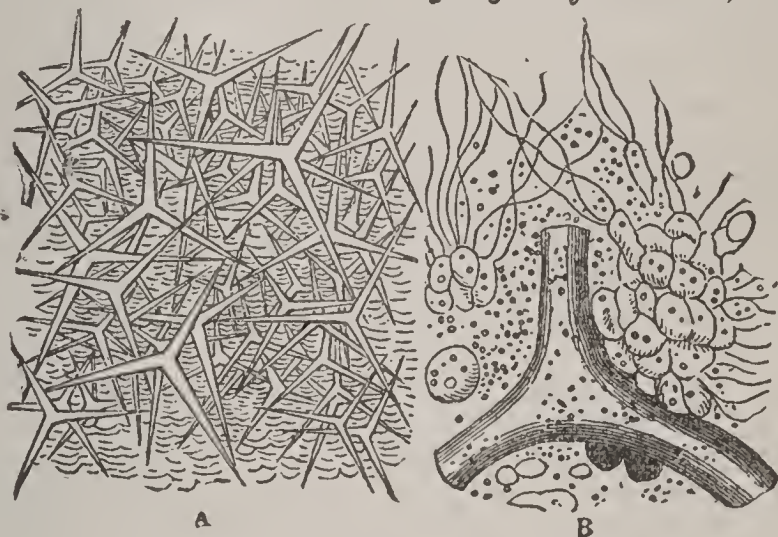
Living Sponge, showing numerous small inhalant terminal, large exhalant orifices.

restricted to definite areas, the so-called 'ciliated chambers'), between which a middle layer of cells, the mesoderm, arises. This may be of very variable thickness, and gives rise to the skeleton. From the close resemblance which the cells of the ectoderm and mesoderm present to *Amœbæ*, and those of the endoderm to those Infusorians known as *Monads*, it was supposed formerly that the sponge is a mere colony of Protozoa. The development of the sponge, however, accords too closely with that of higher animals to admit of such a view, a free-swimming ciliated larva being produced by segmentation of a fertilized ovum; but it is undeniable that in the sponge we have a degree of independence of the cell units far greater than in any other group—a divided sponge readily reunites, and adjacent masses grow together. They assume very various forms, which, as well as the peculiarities in the structure of the

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framework, are characteristic of the different branches, classes, sub-classes, orders, families, genera, and species. Some are nearly globular; some cup-shaped, top-shaped, conical, cylindrical, thread-like, etc.; some are simple, and some branched.

The surface of a living sponge is generally covered with minute pores, through which water is imbibed, carrying with it both the air and the organic particles necessary for support of life. The pores are supposed to be permanent in many of the S., and the currents which enter through them to be produced by cilia or flagella. But in those of the very lowest organization, the pores seem formed for the occasion, just as the *Amœba* opens anywhere to admit food within its substance. In *Spongilla fluviatilis*, a small



Structure of *Grantia compressa*:

A, portion showing general arrangement of triradiate spicules and intervening tissue, magnified; B, small portion highly magnified, showing ciliated cells.—From Carpenter *On the Microscope*.

fresh-water species, the opening and closing of each pore occupies less than a minute, and the pores do not open simultaneously, but in irregular succession, and apparently never again in precisely the same spot. No trace of the pore remains for an instant after its closing, nor is there any indication of the point where a new one is to open. The water which enters by the pores passes out of some sponges by a single orifice, which serves for the whole mass; others have numerous orifices (*oscula*) which are permanent, and much larger than the pores by which the water is imbibed, the whole mass being pervaded by canals which lead from the pores to these orifices, from which, under the microscope, a constant discharge of water may be seen taking place, minute opaque particles being carried with its current. These particles are not only fecal matter, but gemmules and ova.

Reproduction takes place by gemmation, by fission, and by true ova. Many of the gemmules go to increase the sponge-mass; but the greater part finally become detached, and are carried out into the water, to settle down in a new locality. The two sexual elements often occur in the same sponge, but even in that case either the male element

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or the female is found to predominate. In other S. the sexes are distinct. The ova develop from wandering amœboid cells, which increase in size, and acquire a store of nourishment. The spermatozoa also are developed from wandering amœboid cells: they are minute bodies with piriform head and vibratile tail.

The S. employed for domestic and other purposes derive their value from the elasticity and compressibility of their fibrous framework, divested of the glairy substance, and from its power of imbibing fluids. The absence of spicules is essential to a useful sponge. The kinds fit for use are found in the seas of warm climates. Some small species of sponge live at great depths. One has been brought up in the Gulf of Macri from a depth of 185 fathoms.

Fossil remains of S. are found in many rocks, and of horny, fibrous kinds, as well as of those with calcareous or siliceous framework.

Several species of sponge are in use for economical purposes. The softest and finest in texture is the Turkey or Levant sponge (*Euspongia officinalis*). Two other Mediterranean species are not much inferior—*Hippospongia equina* and *Euspongia Zimocca*. On the shores of the Bahamas and the n. coast of Cuba grow bath-sponges of several kinds, one species not inferior to those from the Levant. A very fine bath-sponge occurs on the shores of Australia, in Torres Strait.

The sponge fisheries of Fla. have become in recent years an important industry, subject to special state legislation. The best sponge-ground now is on the w. coast, toward Cedar Keys. In 1890 the sponge-fleet comprised about 300 boats; the haul was the greatest known, averaging \$1,000 for each vessel. Three native kinds are taken: the sheep's wool, worth \$1-\$5 per lb.; the yellow, worth 20-60 cts, and the grass, worth 10-20 cents. A good 3-weeks' trip haul for a single 5-ton boat is 200 bunches of 10-15 S. each, worth when prepared for use \$400-\$450. All S. are taken by pole, diving being prohibited by the state.—Value of total import of S. into the United States, year ending 1890, June 30, \$416,718.

The trade in sponge is large; it is carried on chiefly by the Turks and the inhabitants of the Bahama Islands. The number of men employed in the Ottoman sponge-fishery is between 4,000 and 5,000, forming the crews of about 600 boats. These boats find their chief employment on the coasts of Candia, Barbary, and Syria. The sponge is obtained by diving, the diver taking down with him a flat piece of stone of triangular shape, with a hole drilled through one of its corners; to this a cord from the boat is attached, and the diver makes it serve to guide him to particular spots. When he reaches the growing S., he tears them off the rocks, and places them under his arms; he then pulls at the rope, which gives the signal to his companions in the boat to haul him up. The value of S. collected in Greece and Turkey is about \$500,000 annually. The Greeks of the Morea, instead of

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diving, obtain S. by a pronged instrument; but the S. thus collected are torn, and sell at low price. The best are obtained on detached heads of rock in 8 or 10 fathoms water.

The S. of the Bahamas and other W. Indian islands are of larger size and coarser quality; but large quantities are gathered, and in recent years the industry has yielded about \$250,000 annually. The S. are torn from the rocks by a fork at the end of a long pole. For riddance of the animal matter, they are buried for some days in the sand, and then soaked and washed.

In surgery, sponge is of great value, not only for removing blood in operations, but for checking hemorrhage. Burnt sponge was formerly a valued remedy for scrofulous diseases and goitre; but iodine and bromine, from which it derives all its value, are now administered in other forms.

SPONG'ING-HOUSE, formerly also SPUNGING-HOUSE: in England, usually a sort of tavern, though in Eng. law the private house of a baliiff, who may detain there for 24 hours a debtor arrested for debt, to admit of arrangement by the debtor or his friends to settle the debt. The name is derived from the extortion often practiced there on the debtor.

SPONGIOLES, n. plu. *spŭn'jŭ-ôlz* [L. *spongiŏla*, dim. of *spongiŏa*, a sponge]: in bot., the extremities of roots, composed of loose spongy tissue, through which nourishment is absorbed from the earth: also SPONGIOLETS, n. plu. *spŭnj'ô-lĕts*. SPONGITES, n. plu. *spŭn'jĭts*, fossils of a structure similar to the sponge.



Vertical Section of Orchis Root, highly magnified; *sp.* the spongiole.

SPONGIOPILINE, n. *spŭn-jŭ-ô-pĭ'lĭn* [L. *spongiŏa*, a sponge; *pĭlus*, hair]: a useful and efficient substitute for a poultice, consisting of a mass of shreds of wool and sponge with an India-rubber backing.

SPONSAL, a. *spŏn'sāl* [L. *sponsālĭs*, be- longing to betrothal or espousal—from *sponsus*, promised solemnly; *spondĕrĕ*, to promise: It. *sponsale*, sponsal]: of or relating to marriage, or to a spouse. SPON'SOR, n. *-sĕr*, one who undertakes to answer for another; a surety; in the Rom. Cath. and other prelatical churches, a godfather or godmother at baptism (see GODFATHER AND GODMOTHER): in Bapt., Congl., and Presb. churches (and the 'Reformed' churches generally), no such sponsorship is recognized other than that of the parents or guardians. SPONSORIAL, a. *spŏn-sŏ'rĭ-āl*, pertaining to a sponsor. SPON'SORSHIP, n. the duty or office of a sponsor.

SPONSION, n. *spŏn'shŭn* [L. *sponsiŏ* or *sponsiŏnem*, a solemn promise or engagement—from *spondĕŏ*, I promise solemnly]: the act of becoming security; a solemn act or engagement on behalf of another.

SPONSON, n. *spŏn'sŭn*: in a *paddle-steamer*, the curve of the timbers toward the outer part of the wing, before and abaft the paddle-boxes.

SPONTANEITY, DOCTRINE OF: in mental philosophy, the doctrine that muscular action may and does arise from purely internal causes, and independent of the stimulus of sensations. It had long been the tacit assumption in psychology that we are never moved to action of any kind, except under the stimulation of some feeling, some pleasure or pain, or some end in view. To this is now opposed the doctrine of the Spontaneous beginning of movements under certain circumstances; which, however, does not exclude, but only supplements, the operation of the feelings in stimulating movements, as in the ordinary course of voluntary action. The doctrine supposes that the nerve-centres, after repose and nourishment, acquire a fulness of vital energy, which discharges itself in the play of movement, without any other occasion or motive; the addition of a feeling, or end, enhances and directs the activity, but does not wholly create it.

Of the various evidences and illustrations of S., perhaps the most striking is that furnished by the movements of young animals of the active species. A young dog or kitten shows a degree of activity out of all proportion (it is asserted) to any feeling to be gratified, or any end to be served; we can interpret it only as internal energy seeking vent, irrespective of pursuit of pleasure or avoidance of pain—in other words, irrespective of the action of the will or the organism itself. When the accumulated energy is expended, the animal falls back into repose, and is then roused only by the stimulus of sensation. The state called 'freshness' in a horse, e.g., is a state of superabundant and irrepressible activity. Children go through the same phase: after rest or confinement, they burst forth incontinently into some form of active excitement, of which a part may be considered as pure spontaneity, while part may be owing to sensation. On the other hand, it is suggested that there is lack of certain evidence concerning the ends served or the pleasure involved in the friskiness referred to.

The doctrine of S. is considered suitable to express the difference between the active and the sensitive temperaments; for (it is said) if it were true that action is in proportion to stimulation of the feelings, the most susceptible characters would be the most active; while, in fact, the active temperament is manifested by a profusion of activity for its own sake, and constitutes the restless, bustling, rough-shod, energetic, and enterprising disposition of mind, as seen in sportsmen, soldiers, travellers, etc.—The doctrine is connected with theories of the growth of the Will (q.v.), or voluntary power: see Bain on *The Senses and the Intellect*, 2d ed. 76.

SPONTANEOUS—SPONTANEOUS COMBUSTION.

SPONTANEOUS, a. *spōn-tā'ně-ūs* [L. *spontānēus*, of his own accord—from *spontē*, freely or voluntarily: It. *spontaneo*: F. *spontané*]: acting of one's own accord; done without compulsion; acting from its own impulse or energy; happening or produced of itself. SPONTA'NEOUSLY, ad. -lī. SPONTA'NEOUSNESS, n. -ūs-nēs, the state or quality of being spontaneous. SPONTANEITY, n. *spōn'tā-ně'ī-tī*, quality of acting or proceeding without compulsion or external force; voluntariness.—SYN. of 'spontaneous': voluntary; willing; uncompelled.

SPONTA'NEOUS COMBUS'TION: occasional phenomenon in mineral and organic substances: it consists in a body's producing fire through merely the chemical action of its own elements. The facts connected with spontaneous ignition of *mineral* substances are well known to chemists (see PYROPHORUS). Ordinary charcoal does not undergo combustion in air under a temperature of 1,000°, but in some states it is liable spontaneously to acquire a very high temperature. Thus, lamp-black impregnated with oils, which contain a large proportion of hydrogen, gradually becomes warm, and inflames spontaneously. According to Aubert, Chevallier, and other French observers, recently made charcoal, in a state of fine division, is liable to be spontaneously ignited without the agency of oil. There have been many instances of spontaneous ignition of coals containing iron Pyrites (q.v.), when moistened with water. The pyrites which most readily give rise to S. C. are those in which the protosulphide is associated with the bisulphide of iron. The heaps of shale and refuse coal at the mouths of the pits often take fire spontaneously. Sulphur has no tendency to S. C.; but a mixture of powdered sulphur and iron filings, wetted and covered with earth, becomes in a few hours a kind of small volcano; and carbon-bisulphide vapor has been ignited by solar heat traversing glass. Phosphorus in a dry state has great tendency to ignite spontaneously, and it has been observed to melt and take fire (when touched) in a room in which the temperature was under 70°. The ordinary lucifer-match composition is luminous in the dark, in warm summer nights, which shows that oxidation, and therefore a process of heating, is going on. Hence large quantities of these matches kept in contact may produce a heat sufficient for their ignition. The slacking of quicklime is often attended by development of heat sufficient to set combustible bodies on fire.

As to S. C. in *organic* substances—passing over the accidents from admixture of strong nitric or sulphuric acid with wool, straw, or certain essential oils, we have to consider the cases in which, without contact with any energetic chemical compounds, certain substances—e.g., hay, cotton and woody fibre generally, including tow, flax, hemp, jute, rags, leaves, spent tan, cocoa-nut fibre, straw in manure-heaps, etc.—when stacked in large quantities in a damp state, undergo a process of heating from simple oxidation (eremacausis) or fermentation, and, after a time, may pass into S. C. There is undoubted evidence that

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hay and cotton in a damp state will occasionally take fire without external ignition. Cotton impregnated with oil, when collected in large quantity, is especially liable to ignite spontaneously; and the accumulation of cotton-waste, used in wiping lamps and the oiled surfaces of machinery, has occasioned fires, and led to unfounded charges of incendiarism. Dr. Taylor, author of *Medical Jurisprudence*, instances a fire in a shop from a quantity of oil spilled on dry sawdust. According to Chevallier, vegetables boiled in oil furnish a residue liable to spontaneous ignition; and he remarks that all kinds of woollen articles imbued with oil, and collected in a heap, also hemp, tow, and flax, similarly treated, may ignite spontaneously. Dry wood is supposed by Chevallier and some other chemists to have the property of S. C. Some instances are on record of *apparent* S. C. of such organic nitrogenous matters as damp grain or seeds; and in a case recorded in *Annales d'Hygiène* 1841, Chevallier, Ollivier, and Devergie drew the conclusion that a barn had caught fire from S. C. of damp oats stored in it.

For further details on this important subject, see Graham's 'Report on the Cause of the Fire in the *Amazon*,' in *Quarterly Journal of the Chemical Soc.*, V., 34; article 'Combustion' in Watts's *Dictionary of Chemistry*, I; and the elaborate chapter on S. C. in Taylor's *Principles and Practice of Medical Jurisprudence*.

SPONTANEOUS COMBUSTION OF THE HUMAN BODY.—In medico-legal works, cases are recorded, generally of no recent date, in which it was supposed that the body was either spontaneously consumed by inward combustion, or acquired such extraordinary combustible properties as to be consumed when brought into contact with fire. One of the first cases on record rests on the authority of Le Cat, distinguished surgeon of his time, and is stated to have occurred at Rheims 1725. The remains of a woman named Millet were found burned in her kitchen, about 18 inches from the open fire-place. Nothing was left of the body, except parts of the head, of the legs, and of the vertebræ. Suspicion was excited against her husband, and a criminal inquiry was instituted; but learned experts reported that the case was one of S. C., and the prisoner was acquitted. The facts are now explicable on the supposition that the woman's clothes were accidentally ignited. In reference to this case, Liebig observes that it is easy to see that the idea of S. C. arose at a time when men entertained entirely false views on the nature of combustion. What takes place in combustion generally has been known only since the time of Lavoisier (1743-94); and the conditions which must combine in order that a body continue to burn, have been known only since the time of Davy (1778-1829). Probably more than 60 supposed cases have been recorded in all. From an analysis of all on record to 1851, Liebig gathers that the great majority agree in the following points: 1. They took place in winter. 2. The victims were brandy-drinkers in a state of intoxication. 3. They occurred where the rooms are heated by fires in

SPONTANEOUS GENERATION—SPOOK.

open fireplaces or by pans of glowing charcoal, as in England, France, and Italy: in Germany and Russia, where rooms are heated by closed stoves, cases ascribed to S. C. are exceedingly rare. 4. It is admitted that no one has ever been present during the combustion. 5. None of the physicians who collected the cases, or attempted to explain them, has ever observed the process, or ascertained what preceded the combustion. 6. It is unknown how much time had elapsed from the beginning of combustion to the moment when the consumed body was found.—*Letters on Chemistry*, 3d ed. 1851, 282. Of 45 cases collected by Frank, of Berlin (1843), there are only three in which it is assumed that no fire was near; and Liebig distinctly shows that these three are totally unworthy of belief. The writers who record the other cases assume that the body was ignited by a fire, and then burned like a candle or a bundle of straw, under similar conditions, till nothing but ashes or charcoal was left. Liebig shows the fallacy of their view that excess of fat and the presence of brandy in the body induce abnormal combustibility; and further instances 'the fact that hundreds of fat, well-fed brandy-drinkers do not burn, when by accident or design they come too near a fire.' S. C. in a living body, with the blood in circulation, is (he adds) absolutely impossible. Liebig made thorough investigation of the case of the Countess von Görlitz (1847), who was found dead in her bedroom, with the upper part of her body partly consumed. The physician who was consulted could suggest no other explanation than death by S. C.; but circumstances led to suspicion that she had been murdered by her valet Stauff; and her body was exhumed 14 months afterward. The Hesse Med. College on examination reported that she had not died from S. C.; and the case was then referred to Liebig and Bischoff, whose report was issued 1850, Mar., when Stauff was put on trial. Their conclusion was that the body was wilfully burned *after death*, to conceal the murder (either by strangulation or a blow on the head). The prisoner was convicted, and subsequently confessed that he had committed the murder by strangulation. Since that date, there have been a few supposed cases of S. C. of the human body; but examination by experts has invariably demonstrated the action of extraneous causes.

SPONTA'NEOUS GENERA'TION: see GENERATION, SPONTANEOUS.

SPONTOON, n. *spŏn-tŏn'* [F. *espon-ton*—from L. *punctum*, a point]: weapon like a halberd, which, prior to 1787, was borne instead of a half-pike by officers of Brit. infantry, as a medium for signaling orders to the regt. The S. planted in the ground commanded a halt; pointed backward or forward, advance or retreat, etc.

SPOOK, n. *spók* [D. *spook*; Ger. *spuk*]: ghost; a hobgoblin; a spirit; a spectre.

SPOOL—SPOONBILL.

SPOOL, n. *spól* [Ger. *spule*; Dan. *spole*, a quill, a bobbin: Dut. *spoel*, a quill, a spool]: cane or reed with a knob at each end, or a hollow cylinder of wood surrounded by a ridge at each end, on which thread or yarn is wound: in sewing and lace-making machines, the spools are of metal and in various forms: V. to wind on a spool. **SPOOL'ING**, imp. **SPOOLED**, pp. *spôld*.

SPOOM, v. *spóm*, or **SPOON**, v. *spón* [from **SPUME**, which see]: to rub before the wind—an old sea-term. To **SPOON**, in *rowing*, to dip oars so slightly into the water that they ruffle and skim the surface. **SPOON-DRIFT** [for *spoom- or spume-drift*]: the water of billows at sea scattered in a heavy shower of spray by the violence and intensity of the tempest: also **SPIN-DRIFT**.

SPOON, n. *spón* [AS. *spón*; Ger. *span*; Icel. *spann*; Sw. *span*, a chip: Dut. *spaan*, a chip, a splint: Gael. *spain*, a spoon; *spann*, to divide, as a liquid, to dash]: a well-known instr. of domestic use, consisting of a handle and a broad hollow at one end; an implement for removing earth, etc., from deep holes; *familiarly*, a simpleton; one foolishly bashful and awkward: V. to be in love. **SPOON'ING**, imp. **SPOONED**, pp. *spônd*. **SPOONEY**, n., or **SPOONY**, n. *spón i*, a half-witted foolish person: **ADJ.** weak-minded: silly; love-sick. **SPOONFUL**, n. *fúl*, as much as a spoon will hold: a small quantity. **SPOON'ILY**, ad. *-i-lí*, in a weak and foolish manner. **SPOON-MEAT**, food eaten with a spoon. **SPOON-WORM** (**SIPUNCULOIDEA**): see **SIPUNCULUS**. To **BE BORN WITH A SILVER SPOON IN ONE'S MOUTH**, to be born to wealth or good fortune. **WOODEN SPOON**, in *Cambridge Univ.*, the last on the list of mathematical honors: in general, the least distinguished on a notable list.

SPOONBILL, *spón'bíl* (*Platalea*): genus of wading birds of the Heron family (*Ardeidae*), much resembling storks both in structure and in habits; but distinguished by the remarkable form of the bill, which is long, flat, broad throughout its length, and much dilated in spoon-like form at the tip. The species are not numerous, but widely distributed. The only European species is the **WHITE S.** (*P. leucorodia*); common in Holland, in marshy districts throughout n. Europe and Asia in summer, and in the salt marshes of the coast of Italy in winter: its range extends also over the whole of Africa. It is gregarious, and the flocks of spoonbills generally make their nests in woods, in the tops of lofty trees. It is considerably smaller than the Common Heron. Its color is white, slightly tinged with pink; bill and legs are black. A curious convolution of the windpipe, in the form of the figure 8, is found on dissection in the adult S., but does not exist in the young. The flesh is said to be tender and of good flavor. The S. is easily tamed.—The **ROSEATE S.** (*P. ajaja*) is an Amer. species; abundant within the tropics, and found in the most s. parts of the United States: it is nearly equal in size to the White S., which it resembles in habits. It is a beautiful bird, with plumage of fine rose-color, of which the tint is deepest on the wings; the tail-coverts crimson.

SPOON-DRIFT—SPORE.

SPOON-DRIFT: see under **SPOOM**.

SPOOR, n. *spôr* [Dut. *spoor*, a trace, a track]: the track or trail of an animal, especially of one pursued as game.

SPOR'ADES: see **ARCHIPELAGO**.

SPORADIC, a. *spō-răd'ik* [Gr. *sporadikōs*, dispersed, scattered—from *speirō*, I sow]: scattered. S. cases of disease are those of diseases naturally epidemic or contagious, when those diseases occur in only a few scattered cases—so far, opposed to *epidemic* and *endemic*. The conditions on which depends the occurrence of epidemic or contagious diseases in sporadic form are unknown. Among diseases which occur in this form are especially catarrh, cholera, dysentery, measles, scarlatina, and smallpox.—S. Languages are those isolated languages which cannot be shown to belong to any known family.

SPORANGIFEROUS, a. *spō-răn-jîf'ēr-ŭs* [Gr. *spora*, a seed; *anggos*, a vessel; L. *fero*, I bear]: bearing or producing spores. **SPORANGIOLES**, n. plu. *spō-răn-jî'î-ôlz*, very minute sporangia.

SPORANGIUM, n. *spō-răn'jî-ŭm*, plu. **SPORAN'GIA**, *-jî-ă* [Gr. *spora*, seed; *anggos*, a vessel]: in *bot.*, the immediate case or covering to the spores of some cryptogamic plants.

SPORE, n. *spôr*, or **SPORULE**, n. *spôr'ul* [Gr. *spora*, seed], in Botany: in a sense the *seed* of a cryptogamous plant, as it serves the same purpose of reproduction as the seed of a phanerogamous or flowering plant, and after remaining for a time in a state of rest, is developed into a new plant on occurrence of the necessary conditions. A

S., however, differs very much from the seed of a phanerogamous plant; as it always consists of a single cell, therefore does not contain any *embryo* or rudiment of the future plant. In its formation, it corresponds rather with the grains of pollen in the anther of a flower. Spores are small, often so minute as to be invisible to the naked eye—many of them extremely minute, so that they may be wafted about unperceived; even the spores of the



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largest ferns are very small. Spores often remain for many years capable of germination; and they seem capable of enduring much drought without destruction. They seem to germinate indifferently from any part of their surface, in which they differ essentially from the seeds of phanerogamous plants. In the parent plant, they are either scattered singly, or are united in a fruit-like envelope, generally known as a *Sporangium*, or *Spore-case*. In some plants, they are united in definite numbers, as of four (a *tetraspore*), surrounded by an envelope (*perispore*, or *sporidium*). The peculiar reproductive organ, which in some cryptogamous plants produces the spores, is called a *sporocarp*, or *sporophore*. In many plants, e.g., mushrooms, the production of spores belongs exclusively to a part of the plant called the *hymenium*.

SPORESACS—SPORTS.

SPORESACS, n. plu. *spōr-săks'* [*spore*, and *sac*]: in *cool.*, the simple generative buds of certain hydrozoa, not having the medusoid structure developed.

SPORIDIUM, n. *spō-rīd'ī-ŭm*, **SPORIDIA**, n. plu. *spō-rīd'ī-ă* [Gr. *spora*, seed; *eidos*, likeness]: in *bot.*, small spores or *conidia*, developed by budding in certain fungi.

SPOROCARP, n. *spōr'ō-kārp* [Gr. *spora*, seed; *karpos*, fruit]: in *bot.*, the sac containing the spores in *Marsilëacëæ*; the fruit in *Carposporëæ*. **SPOROPHORE**, n. *spōr'ō-fōr* [Gr. *phorëō*, I bear]: in *bot.*, the asexual or spore-bearing generation in plants which exhibit so-called alternation of generations.

SPORRAN, n. *spōr'răn* [Gael. *sporan*, a purse]: a pouch made of skin with the hair outward, often highly ornamented, worn in front of the kilt by a Highlander in full dress.

SPORT, n. *spōrt* [OF. *desporter*, to amuse—from L. *dis*, away; *portāre*, to carry: It. *diporto*, solace, recreation: Gael. *spors*, diversion, sport]: diversion; anything which makes merry; the mirth or pleasure thus produced; play; game; frolic; mockery; anything driven helplessly about; fowling, hunting, or fishing: V. to divert; to make merry; to frolic; to play; to jest; to trifle; in *familiar language*, to exhibit or wear, as an article of dress. **SPORT'ING**, imp.: **ADJ.** practicing the diversions of the field in hunting, fishing, etc.; given to racing, betting, and gambling: N. practice or pursuit of a sportsman. **SPORT'ED**, pp. **SPORT'ER**, n. *-ēr*, one who sports. **SPORT'FUL**, a. *fŭl*, frolicsome; full of jesting; merry; wanton; ludicrous. **SPORTFULLY**, ad. *-lī*. **SPORT'FULNESS**, n. *-nēs*, the state of being sportful; a playful disposition. **SPORT'IVE**, a. *-īv*, inclined to mirth; playful; gay; merry; frolicsome. **SPORT'IVELY**, ad. *-lī*. **SPORT'IVENESS**, n. *-nēs*, the state of being sportive; playfulness. **SPORT'INGLY**, ad. *-lī*. **SPORTSMAN**, n. *spōrts'măn*, one who indulges in the sports of the field; one skilled in hunting, shooting, or fishing, etc. **SPORTSMANSHIP**, n. skill in field-sports. **IN SPORT**, in jest; for play or diversion. **TO SPORT ONE'S OAK** [perhaps Ger. *pforte*, a door]: in *Eng. universities*, to shut the outer door of one's room.

SPORTS, **BOOK OF**: popular name of the Declaration of Sports, issued by James I. of England, 1618, to signify his pleasure that on Sundays, after divine service, 'no lawful recreation should be barred to his good people, which should not tend to the breach of the laws of his kingdom and the canons of his church.' The sports specified were dancing, archery, leaping, vaulting, May-games, Whitsun-ales, morrice-dances, and the setting up of May-poles. The occasion of this proclamation was the action of some Puritan authorities in Lancashire, who, in illegally suppressing, instead of regulating, the customary recreations of the common people, had excited much discontent, and increased the influence of the Rom. Catholics by giving a repulsive aspect to the Reformed religion. Although the Declaration was ordered to be read in the parish churches of the diocese of Chester, this order was not enforced, and

SPORULE—SPOTSWOOD.

the king's design was allowed to drop. Among the excepted unlawful sports were bear-baiting, bull-baiting, bowling, and interludes. Non-conformists and others not attending divine service at church were prohibited from joining in the sports; nor was any one allowed to go out of his own parish for that purpose, or to carry offensive weapons. By republishing this Declaration 1633, and enforcing with great severity the reading of it by the clergy in their churches (see SABBATH), Charles I. and Laud excited among the Puritans a degree of indignation which contributed not a little to the downfall of the monarchy and the church. In 1644, the Long Parliament ordered all copies of it to be called in and publicly burned.—Heylin's *Hist. of the Sabbath* and *Life of Laud*, Fuller's *Church History*, D'Israeli's *Life of James I.*, Southey's *Book of the Church*, Hallam's *Constitutional History of England*, and Cox's *Literature of the Sabbath Question*.

SPORULE: see SPORE.

SPOT, n. *spõt* [Dut. *spatten*, to bespatter or splash; *spat*, a drop of what is splashed: Sw. *spott*, spittle: Dan. *spætte*, a spot]: a mark; a place discolored; a stain; reproach; blemish; a small extent of place; any particular spot; a small part of a different color from the ground on which it is, as a dress with black *spots*; a dark mark on the sun: V. to make a mark or marks on; to stain; to discolor; to blemish; to disgrace; in *slang*, to take special notice of; to notice; to recognize. SPOT'TING, imp.: N. the putting one's mark upon a person. SPOT'TED, pp.: ADJ. marked with spots. SPOT'LESS, a. -*lē's*, free from spots; pure; blameless; immaculate; irreproachable. SPOT'LESSNESS, n. -*nēs*, freedom from spots or stains. SPOT'TEDNESS, n. -*nēs*, the quality of being spotted. SPOT'TY, a. -*tī*, full of spots, or characterized by them. SPOT'TINESS, n. -*nēs*, state or quality of being spotty. UPON THE SPOT, immediately; before moving. SPOTTED FEVER: see MENINGITIS. SPOTTED LACE, lace on which the pattern consists of small raised marks. TO LIVE UPON THE SPOT, to reside; not to be an absentee.—SYN. of 'spot, n.': speck; flaw; stain; blemish; blot; fault; disgrace; reproach; place; locality; site.

SPOTSWOOD, *spõt'swûd*, ALEXANDER: 1676-1740, June 7; b. Tangier, Africa: Brit. soldier. He entered the English army at an early age, served under the Duke of Marlborough, was wounded at Blenheim, became deputy quartermaster-gen., and was appointed gov. of Va., reaching his post 1710, June. He held the office till 1723, and did much to strengthen and develop the colony, also to promote William and Mary College. 1730-39 he was deputy postmaster-gen. of the colonies, and 1740 was appointed maj.gen. to command an expedition to the W. Indies, but died while superintending preparations. His *Official Letters* were pub. by the Va. Hist. Soc., 2 vols. (1882-85).

SPOTSWOOD—SPOUSE.

SPOTSWOOD, *spōts'wūd* (or SPOTISWOOD, or SPOTTISWOOD, *spōt'is-wūd*), JOHN, Archbishop of St. Andrews: 1565-1639, Dec. 26; son of John S., superintendent of Lothion, Scotland. He was educated at the Univ. of Glasgow, and on his father's death succeeded him as parson of Calder. When James succeeded to the English crown, S. accompanied him on his journey to London, and, soon afterward, on the death of Abp. James Beaton, was appointed to the see of Glasgow. He was chosen moderator of the gen. assembly of the Scottish Church, at Glasgow, 1610, and completed the establishment of episcopal government, which James had long labored to accomplish. In 1615, he took a leading and discreditable part in the examination of John Ogilvie, Jesuit priest, who was apprehended at Glasgow, and hanged for refusing to disown the temporal power of the pope. In the same year, he was translated to the see of St. Andrews. As primate of the Scottish Church, S. had now the chief management of ecclesiastical affairs, and great influence also in the civil government, and his rule was marked by uniform ability, and, with a few exceptions, by prudence and moderation. He presided at the gen. assembly at Perth, 1618, and sanctioned the five points of ecclesiastical discipline known as the Perth Articles. He was as much in favor with Charles I. as with King James, and crowned King Charles at Holyrood, 1633. In 1635, S. was made chancellor of Scotland, a dignity which no ecclesiastic had held since the Reformation, and which brought misfortune to him. He reluctantly entered into the king's unwise measures for introduction of a liturgy into Scotland, and became a chief object of popular dislike when the Covenanters gained ascendancy. He soon found it necessary to retire to England. He protested against the lawfulness of the gen. assembly at Glasgow, 1638, Nov.; and was deposed and excommunicated by that body for alleged immoralities, which, so far as his private character was concerned, were improbable in themselves, and without evidence. He died at London, and was interred in Westminster Abbey.—The writings of S. are his well-known *History of the Church of Scotland*, pub. 1655; a Sermon preached at the meeting of the Perth Assembly 1618; and a Latin treatise, *Refutatio Libelli de Regimine Ecclesiæ Scoticanæ*, pub. 1620, in answer to a tract of Calderwood's. See Life ascribed to Bp. Duppa, prefixed to folio editions of his *History*; and Life by Bp. Russell, prefixed to the Spottiswood Soc. ed. of the same work.

SPOTTSYLVANIA COURT-HOUSE, BATTLES OF: see WILDERNESS, BATTLES OF THE.

SPOUSE, n. *spowz* [OF. *espouse*; F. *épouse*, a consort—from L. *sponsus*, promised; *spondēre*, to promise: It. *sposo*, a husband: comp. Gael. *pos*, to wed, to marry]: a married person, husband or wife: V. in *OE.*, to espouse. SPOUSAGE, n. *spowz'āj*, the act of espousing; marriage. SPOUSELESS, a. *-lēz*, destitute of a married partner. SPOUSAL, a. *spowz'āl*, pertaining to marriage; connubial; nuptial. SPOUSALS, n. plu. *-ālz*, marriage; nuptials.

SPOUT—SPRAGUE.

SPOUT, n. *spout* [Norw. *sputra*, to keep spitting. to spirt: Dut. *spuiten*, to spout; *spuit*, a spout: Sw. *sputa* or *spruta*; Dan. *sprude*, to spout: Gael. *spùt*, a spout]: the projecting mouth of a vessel, by which a liquid may be poured out without spilling; a pipe or conductor of water; a lift or shoot; a water-spout: V. to throw or pour out water forcibly, as from a pipe; to issue with much force; to pour out words with affected grandeur; to speechify, in contempt. **SPOUT'ING**, imp.: **ADJ.** throwing or issuing in a stream from a pipe; haranguing or speechifying: N. a speech, in contempt. **SPOUT'ED**, pp. **SPOUTER**, n. *-ér*, one who or that which spouts. **UP THE SPOUT**, in *slang*, in the pawnbroker's, in allusion to the *spout* through which the pledges are sent to the upper store-rooms.

SPRACK, a. *språk*: the proper spelling of **SPRAG** 2, which see: in *OE.*, vigorous; sprightly.

SPRAG, n. *spräg* [Dan. *sprække*, to crack, to burst: Sw. *spricka*, to split, to sprout: connected with **SPRIG**, which see]: a young salmon; a rough stout bar of wood: V. to stop a wagon by putting a strong bar of wood between two spokes of a wheel. **SPRAG'ING**, imp. **SPRAGGED**, pp. *sprägd*: **ADJ.** having the motion arrested by a sprag.

SPRAG, a. *spräg* [Icel. *sprækr*, brisk, fiery; *sparkr*, lively: Gael. *spraic*, vigor: connected with **SPARK**]: in *OE.*, quick; lively; active; alert.

SPRAGUE, *spräg*, HOMER B., PH.D.: educator: b. Sutton, Mass. He graduated from Yale 1852; taught in New Haven; was for three years principal of the Worcester, Mass., high school; and then gave attention to the study and practice of law. He was in the Union army 1861, Dec.—1866, Apr., entering as capt. and reaching the rank of col.; was principal of the State Normal School, New Britain, Conn., 1866-68; also served in the state legislature. He was afterward prof. in Cornell Univ., principal of the Adelphi Acad., Brooklyn, head-master of the girls' high school, Boston, 1876-85; founded the Martha's Vineyard Summer Institute; and 1887 became pres. of the Univ. of N. Dakota.

SPRAGUE, *spräg*, WILLIAM BUELL, S.T.D., LL.D.: 1795, Oct. 16—1876, May 7; b. Andover, Conn.: Presb. clergyman and author. After graduation at Yale 1815, and two years of teaching, he studied theol. at Princeton, was pastor of the First Church (Congl.) of West Springfield, Mass., 1819-29, and of the Second Presb. Church of Albany, N. Y., 1829-69, removing thence to Flushing, L. I., where he died. He was noted in his profession, and also as a collector of autographs (100,000), and of pamphlets, giving the latter and valuable MSS. to the N. Y. state library, and to Harvard a collection of the papers of Gen. Gage. Besides very many sermons and other occasional productions, he published *Letters to a Daughter* (1827); three vols. addressed to young men (1830, 44, 48); *Letters from Europe* (1828); *Lectures on Revivals* (1832); *Lectures on the Contrast between True Christianity and Other Systems* (1837); *life of Dr. Griffin* (1838); *Aids to Early Religion* (1847); *Women*

SPRAIN.

of the Bible (1850); and *Annals of the American Pulpit*, 9 vols. (1857-69), the last a work of great research and high authority.

SPRAIN, n. *sprān* [OF. *espreindre*, to press, to strain—from L. *exprimĕrĕ*, to squeeze out—from *ex*, out; *primĕrĕ*, to press]: excessive strain of the muscles or ligaments of a joint, causing much pain: V. to overstrain the ligaments of a joint without dislocation. SPRAIN'ING, imp. SPRAINED, pp. *sprānd*.—*Sprain*, or *Strain*, is a term in surgery, designating a violent stretching of tendinous or ligamentous parts with or without rupture of some of their fibres. Sprains are easily induced in all the joints of the upper limbs, especially in the wrist and the articulations of the thumb. In the lower extremity, the ankle is the joint by far the most frequently affected; this is accounted for anatomically by the small size of the articular surfaces, the great weight which the astragalus (the bone presenting the lower articular surface) has to support, and the unyielding nature of the lateral ligaments. In slight sprains of this joint, the ligaments are only stretched or slightly lacerated; in severe cases they may be completely torn through. Sprains of the ankle are sometimes mistaken for fractures, and *vice versâ*; and the two injuries may co-exist. The pain and swelling sometimes make an accurate diagnosis difficult, especially if the patient is not professionally examined for some time after the accident; and if any doubt exists, the case should be treated as for the more severe injury, since it is better that the treatment be prolonged than that the patient should be maimed; and fortunately, the proper treatment of fracture is the best also for sprain. Sprains of the knee are not rare, and are characterized by great swelling from effusion of fluid within the joint. Sprains of the back are frequent, and are among the most serious of any; but in most cases it may be anticipated that after confinement in bed or on a sofa for two or three weeks, and with proper treatment, the patient will be able to walk, though he may feel stiffness and pain for several weeks longer. The treatment of sprains generally must be regulated by their severity. In a severe sprain, with much pain and inflammation, leeches should be applied, followed by hot-water fomentations, or application of hot linseed-meal poultice. In slighter cases, rest and cold lotions are sufficient treatment. In all cases of sprain of the extremities, thin pasteboard splints placed on the outer and inner surfaces of the joint, over a wet bandage previously laid round it, afford support to the part, and comfort to the patient. In sprains of the back, more decided antiphlogistic or lowering measures are required. After due medical treatment, nothing will conduce more to the comfort of the patient than well-managed fomentation of the back. Amendment will be denoted by the patient's turning in bed more freely, and seeking to sit up. At that period, stimulating liniments, or application of the compound tincture of iodine, will be called for. When able to walk, he will be benefited by a warm plaster on his loins.

SPRANG—SPRAT.

SPRAINS, or **STRAINS**, are very common among horses, owing to the severe exertions required of them, often while young. Various muscles, ligaments, and tendons are liable to strain, but none more frequently than the large tendons passing down the back of the fore-limbs. In slight cases, cold water continuously applied for several hours gives relief; but in all serious cases, diligent fomentation with water about the temperature of 100° is preferable; or the injured part may be swathed in a thick woolen rug, kept constantly moist and warm by frequent wetting with the hot water. Perfect rest is essential; and, to insure relaxation of the large tendons of the horse's limbs he may in bad cases be kept slung for several days. Blisters, hot oils, firing, and all such irritants, are on no account to be used until the inflammation abates, and the part becomes cool, and free from tenderness. Such remedies may then be useful for causing reabsorption of swelling, perhaps also for invigorating the weakened part.

SPRANG: pt. of **SPRING**, which see.

SPRAT, n. *sprāt* [Dut. *sprot*, a young animal, a sprout: Gael. *sprott*, a sprat], (*Harengula sprattus*, formerly *Clupea sprattus*): fish of the herring family (*Clupeidæ*), very abundant on many parts of the British coast, and elsewhere in the n. Atlantic. It is smaller than the herring, being only about six inches in length when full grown; but much resembles it, though easily distinguished by the serrated belly, and by the position of the fins, the ventral fins beginning immediately beneath the first ray of the dorsal fin, and not beneath the middle of it, as in the herring and pilchard. Notwithstanding many differences, an old opinion has recently been revived, that the S. is the young of the herring, which, therefore, it is injurious to a more important fishery to capture. For this theory sufficient evidence has not yet been adduced. Drift-net fishing is practiced as for herring; also *stow-boat* fishing, with a large bag-net suspended between two horizontal beams beneath the boat, and about a fathom from the bottom of the water. Vast quantities of sprats are taken in Britain, so that they are used as manure by farmers; while their cheapness makes them a favorite food of the poorer classes. In Scotland they are called *garvies*. Notwithstanding its cheapness, the S. is a very fine fish, of flavor quite equal to the herring, though decidedly different. Dried sprats are a very common article of provision, and sprats are also sometimes salted. The *kilkie*s brought from Riga and other ports on the Baltic are sprats cured with spices; and many of the boxes of *Sardines* from the w. coast of France, are filled really with sprats—Very closely allied to the S. is *Harengula latulus*, the *Blanquette* of the French, caught in great abundance on parts of the w. coast of France.—Other species of *Harengula* are found in other seas: one (*H. humeralis*), which abounds in the W. Indies, and s. as far as Rio Janeiro, is much esteemed, but becomes poisonous at certain seasons, from some unknown cause.

SPRAWL--SPRIG.

SPRAWL, *v.* *sprawl* [Sw. *sprattla*; Dan. *sprælle*, to toss about the limbs: Dut. *spartelen*, to frisk, to wag one's legs. Icel. *sprökla*, to throw about the limbs]: to stretch the body and limbs wildly and carelessly while lying; to lie with the limbs stretched out or struggling; in *OE.*, to struggle as in the convulsions of death. **SPRAWL'ING**, *imp.*: **ADJ.** tumbling with agitation or contortion of the limbs. **SPRAWLED**, *pp.* *sprawled*.

SPRAY, *n.* *sprā* [It. *spruzzare*, to shower down, as water upon stones: Ger. *spritzen*, to spatter: Sw. *spratta*, to scatter: OHG. *sprad*, a bush: Gael. *spreigh*, to scatter, to burst open]: a small shoot or branch of a tree, or a collection of them; a twig; scattered drops of water dashed or blown into the air.

SPREAD, *v.* *sprēd* [Dut. *spreiden*; Ger. *spreiten*; Sw. *sprida*; Dan. *sprede*, to spread, to scatter: comp. Gael. *spreigh*, to scatter, to branch]: to stretch or expand to a broader surface; to overlay one substance with another; to extend; to cover; to expand itself in all directions; to be extended or stretched; to overlay; to emit; to circulate, as news or fame; to propagate, as disease; to unfurl, as sails; to cause to be extensively known; to diffuse; to scatter over a surface; to fill or cover a wider space: **N.** extent; compass. **SPREAD'ING**, *imp.*: **ADJ.** extending over a large space; wide: **N.** act of extending or expanding. **SPREAD**, *pt.* and *pp.* **SPREAD'ER**, *n.* *-er*, he who or that which spreads; a divulger; a disseminator.—**SYN.** of 'spread, *v.*': to disperse; distribute; scatter; disseminate; diffuse; circulate; propagate; publish: sprinkle; expand; stretch.

SPREAD EAGLE. see **EAGLE**.

SPREE, *n.* *sprē* [Icel. *sprækr*, brisk, fiery: Gael. *spraic*, vigor, exertion: comp. F. *esprit*, spirit, vivacity]: *familiarly*, a merry frolic; a wild ebullition of spirits, especially in a disorderly and thoughtless indulgence in liquors.

SPREE, *sprā*: river of Prussia, rising near Ebersbach in e. Saxony, on the borders of Bohemia, and after an irregularly winding, but generally n. and n.w. course of 200 m. flowing into the Havel (q.v.) at Spandau. It flows through a low and marshy region; abounds in fish, and frequently expands into lakes, the largest of which are the *Schwiebelschsee* and *Müggelssee*. Its banks are flat, sometimes sandy and wooded, sometimes rich in meadow-pastures. It becomes navigable for small craft at Kosenblatt. The principal towns past or through which it flows are Bautzen, Spremberg, Kottbus, Lübben, Beeskow, and Berlin. Its trade is considerable. By the Friedrich Wilhelm's or Müllrose canal, it is connected with the Oder.

SPRENG'EL EXPLOSIVES: see **EXPLOSIVES**.

SPRIG, *n.* *sprīg* [AS. *sprec*; Icel. *sprek*, a twig or stick: W. *brigyn*, a twig, a shoot of a tree]: a small shoot or twig; offspring; a scion, generally in contempt, as a *sprig* of nobility; a small nail without a head: **V.** to mark or adorn with sprigs; to work or strengthen with sprigs. **SPRIG'ING**, *imp.* **SPRIGGED**, *pp.* *sprīgd*. **SPRIGGY**, *a.* *sprīg'gī*, full of sprigs.

SPRIGT—SPRING.

SPRIGT, n., or **SPRITE**, n. *sprīt* [corrupted from **SPIRIT**, which see]: in *OE.*, a spirit; a shade; incorporeal agent; apparition: **V.** in *OE.*, to haunt as a sprite. **SPRIGT'ING**, imp. **SPRIGT'ED**, pp. **SPRIGT'FUL**, a. in *OE.*, lively; gay; vigorous. **SPRIGT'LESS**, a. in *OE.*, spiritless; dull; sluggish. **SPRIGT'LY**, a. *-lī*, spirit-like; brisk, lively; animated; full of life and activity. **SPRIGT'LINESS**, n. *-lī-nēs*, the quality of being sprightly; liveliness-briskness.

SPRING, n. *spring* [Sw. *springa*, to burst, to spring forth: Ger. *springen*; Dan. *springe*, to spring: Sw. *spraka*; Dan. *sprage*, to crackle]: a leap; a bound; elastic power or force; the start, as of a plank; an elastic body, as a steel rod, a coil of wire, India-rubber, etc., used for various mechanical purposes (see **SPRINGS**, **MECHANICAL**): source; fountain of water (see below); rise; beginning: season when plants begin to vegetate and grow—one of the four seasons of the year: lower part of an Arch (q.v.): **V.** to appear suddenly; to cause to explode, as a mine; to burst; to bound or leap; to pass by leaping; to proceed or issue, as from a source or ancestors; to begin to grow out of the ground; to germinate; to come into existence; to open, as a leak; to begin to appear or exist; to arise, as the day; to proceed, as from a cause; to move by elastic force. **SPRING'ER**, n. *-ēr*, a dog for setting up game, allied to the spaniel and the setter (see below): a young plant. **SPRING'ING**, imp.: **ADJ.** gushing from, as a spring: **N.** the act or process of leaping, issuing, or proceeding; growth; in *arch.*, the first course of stones of the arch resting on the side walls. **SPRANG**, pt. *språng*. **SPRUNG**, pt. pp. *språng*, arisen. **SPRINGY**, a. *språng'ī*, having great elastic force or power; having the power of restoring itself after being bent; spongy; abounding with springs. **SPRING'INESS**, n. *-ī-nēs*, the power of springing; elasticity; power of restoring itself after being bent. **SPRING'ER**, n. *-ēr*, one who or that which springs: the point at which an arch unites with its support (see **ARCH**). **SPRING-BOARD**, an elastic board secured at the ends, used in performing feats of agility, or for exercise. **SPRING'BOK**, or **-BOC**, n. *-bōk* [Dut. *spring-bok*—from *springen*, to spring, and *bok*, a he-goat]: a species of antelope. **SPRING-GUN**, a firearm discharged by a spring when trodden upon. **SPRING-HEAD**, fountain or source. **SPRING-TIDES**, the high tides which occur about the time of new and full moon. **SPRINGTIME**, the season of spring. **SPRING-WHEAT**, species of wheat sown in spring. **INTERMITTENT SPRINGS**, springs whose waters generally come with an alternate rush and a pause. **MINERAL SPRINGS**, outflows of water from the ground, which are impregnated with various mineral substances (see **MINERAL WATERS**, **NATURAL**). **OIL-SPRINGS**, outflows of oil from large natural deposits in the bowels of the earth, arising from organic matter, either vegetable or animal (see **PETROLEUM**). **To SPRING A FENCE**, to leap a fence. **To SPRING A LEAK**, in a *ship*, to open in the seams of the planking to the extent of becoming leaky. **To SPRING A MAST**, said of a mast when it is bent or strained, or started

SPRING.

from its fastenings. To SPRING A MINE, to cause it to explode. To SPRING A RATTLE, to put a rattle in motion. To SPRING AT, to leap toward. To SPRING FORTH, to leap out; to rush out. To SPRING IN, to enter with a leap, or in haste. To SPRING UPON, to rush on with haste or violence; to assault.—SYN. of 'spring, v.': to bound; leap; jump; arise; proceed; issue; appear; grow; thrive; start; shoot; discharge.

SPRING, n. *spr̃ing* [comp. Gael. *spruan*, brushwood]: in *OE.*, a plant; a young tree; a coppice; a grove.

SPRING: stream of water issuing from the earth. The source of springs is the rain and snow that fall from the clouds. Very little of the water precipitated in any district finds its way immediately by rivers to the sea; the great proportion is either evaporated from the surface of the earth, and, reabsorbed by the atmosphere, is taken into use by plants and animals, or sinks into the earth. All loose soils and gravels greedily absorb water, which descends until it meets with a stratum through which it cannot penetrate. A pit dug into the water-charged soil would speedily fill itself by draining the water from the soil. All rocks contain water; some retain it by capillary attraction, like a sponge; others hold it merely mechanically, and easily part with it. Chalk will absorb and retain one-third of its bulk of water; sand, while it will absorb as much, will part with nearly the whole amount to a well dug in it. Argillaceous deposits and compact rocks are barriers to the passage of water, and cause the superincumbent pervious strata to become water-logged, where there is no outlet. Sometimes the edges of the strata are exposed on the sides of a valley, and permit free escape of the contained water, which pours from them over the neighboring land. But rents and fissures, as well as inequalities on the surface of the impervious beds, give the water a circumscribed course, and cause it to issue in springs.

The water, as it percolates through the earth, always becomes more or less charged with foreign matter, owing to its solvent property. Carbonate, sulphate, and muriate of lime, muriate of soda, and iron, are the most common impurities in spring-waters; magnesia and silica also frequently occur. These substances, from evaporation of part of the water, or escape of the carbonic acid gas, by which so large a quantity is often held in solution, are frequently deposited on the margins of the springs, or in the courses of the streams flowing from them. Such deposits are found in all so-called petrifying springs; and the hot wells of Iceland and the Azores are surrounded with basins formed of silicious sinter derived from the water. When the foreign ingredients have medicinal qualities, the springs are known as Mineral Waters (q.v.).

Springs are either associated with the superficial strata, or rise from considerable depth. *Surface-springs* occur where the absorbent surface-deposits rest on an impervious bed, which prevents further downward progress of the water, or where the beds through which the water flows

SPRING.

are near the surface, as in fig. 1, where C and E are impervious clay-beds, and D is a bed of sand or gravel, which in the upper portion is exposed on the surface, or is overlaid by only loose soil, and after being covered for some distance by the clay-bed C, makes its appearance again at B, where the valley cuts it through here the water collected over the area, A, is discharged. Surface-springs, depending so directly on rain for supplies, are very variable in the amount of water that they deliver. They frequently fail entirely in the summer, and always after great droughts. Their temperature varies with that of the district, being warm in summer, and cold in winter, as they do not penetrate below that plane in the earth's crust which is affected by the seasonal changes in temperature.

When the bed which forms the reservoir for a spring is at such distance from the surface as to be beyond the zone of season changes, yet within the zone influenced by the climate, the water has a temperature equal to the mean temperature of the locality where it springs. Such springs

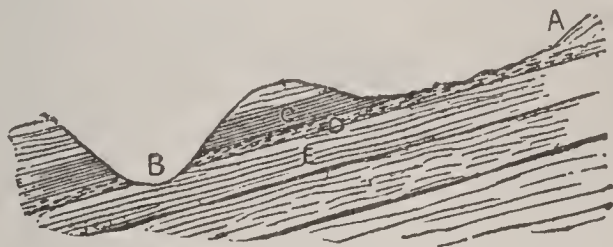


Fig. 1.

have generally a large area for collection of the superficial water, and are consequently regular in the quantity of water that they deliver. They are brought to the surface by means of faults (see FAULT: DISLOCATION, in Geology).

Most deep wells have a lower origin than the zone of climate temperature, which in the United States reaches the depth of 60—80 ft. It is well known that a regular increase in the temperature is observed after this zone is passed, equal to 1° of F. for every 55 ft. As wells have a temperature corresponding to that of the strata from which they spring, it follows that the deeper the spring (below the zone of climate temperature) the higher will be its temperature. Local conditions may affect the thermal state of springs, as in the Geysers in the active volcanic district in Iceland, and the warm springs near Naples; but where no such local influences exist, the depth of the bed whence the water comes may be to some extent estimated by its temperature. Thermal springs occur in Britain at Matlock (66° F.) and Buxton (82°) in Derbyshire, at Bath (117°) in Somerset, and at Clifton (76°) in Gloucestershire. For thermal springs in the United States, see MINERAL WATERS, NATURAL. Artificial communications have been opened with deep-lying strata, by which the water there contained has been brought to the surface, and in these the temperature is found to increase in proportion to the depth of the bore: see ARTESIAN WELLS. The

SPRING.

most remarkable thermal springs are the Geysers of Iceland: see GEYSER.

Intermittent springs are produced sometimes by the ebb and flow of the tide, as at Richmond near London, where the rise at high water is seen in the wells which flow from the arenaceous strata on the banks of the Thames; and sometimes they depend on supply from rain. But there is a kind of spring whose intermittence is believed due to the structure of the internal cavities from which the supply is obtained (see fig. 2). The large reservoir, A, is fed by the rain percolating through the rock: it communicates with the surface by a siphon shaped tube, BCD. As long as the water in the reservoir is at a lower level than the arch of the siphon at C, no water can escape (see SIPHON); but

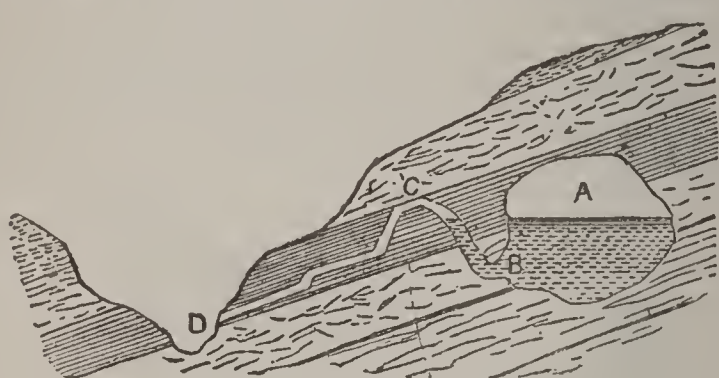


Fig. 2.

as soon as it reaches its level, the whole of the water in the cavity will be drawn off, the spring will then cease, and will reappear only when sufficient water has accumulated to permit the siphon again to act.

SPRING, *spring*, GARDINER, D.D., LL.D.: Presbyterian clergyman: 1785, Feb. 24—1873, Aug. 18; b. Newburyport, Mass.; son of Samuel S., D.D. He graduated at Yale 1805; studied law in New Haven and was admitted to the bar 1808; studied theol. at Andover Seminary; and 1810, Aug. 10, was ordained pastor of the Brick Presb. Church in New York, where he remained till his death, though offered the presidency of Hamilton and Dartmouth Colleges. His influence as preacher and pastor was very great. In 1816 he promoted the formation of the Amer. Bible Soc.; 1825 of the Amer Tract Soc.; and 1826 of the Amer. Home Missionary Soc. His publications were numerous, and included *Essays on the Distinguishing Traits of Christian Character* (1813); *Fragments from the Study of a Pastor* (1838); *Obligations of the World to the Bible* (1841); *The Bible Not of Man* (1847); *The Power of the Pulpit* (1848); *The Mercy Seat* (1849); *Contrast between Good and Bad Men*, 2 vols. (1855); *Pulpit Ministrations*, 2 vols. (1864); and *Personal Reminiscences of the Life and Times of Gardiner Spring*, 2 vols. (1866).

SPRING—SPRING-BALANCE.

SPRING, SAMUEL, D.D.: 1746, Mar. 10—1819, Mar. 4; b. Northbridge, Mass.: Congl. minister. He graduated at the College of N. J. 1771; studied theol., and was licensed to preach 1774; was chaplain in Arnold's expedition to Canada 1775 and in the revolutionary army 1776; and 1777, Aug. 6, was ordained pastor of the Second Congl. Church in Newburyport, Mass., where he remained till his death. He aided in organizing the Andover Theol. Seminary, the Mass. Missionary Soc., and the Amer. Board of Commissioners for Foreign Missions; was a leader of the Hopkinsians in theology (see HOPKINS, SAMUEL); edited *The Massachusetts Missionary Magazine*; and published many sermons and controversial works.

SPRINGAL, n. *spring'äl* [from SPRING 1]: in *OE.*, a youth; a nimble young man; an anc. military engine for throwing stones and arrows.

SPRING'-BALANCE; apparatus for measuring weight or force by the elasticity of a spring of steel. It consists of a spring in a cylindrical coil, through which passes freely a graduated bar, having a hook attached to its under end, and a plate to its upper (fig.). The spring is inclosed in an oblong or cylindrical box, quite closed except at the bottom, where there is a hole just large enough to allow the free passage up and down of the graduated bar. When the instrument is to be used, it is suspended by a ring fastened to the upper part of the box; the weight to be estimated is then hung on the hook, and pulls down the rod, the button or plate at the top of which compresses the helical spring within against the bottom of the box; and the graduation corresponding to this amount of compression of the spring, is read off at that part of the rod which just shows itself outside. In another form of the spring-balance (Salter's Balance) a brass index-plate is attached to the side of the box, and a vertical slit through both plate and box is made from top to bottom; the weight is in this case read off on the plate by a pointer fastened to the spring, and protruding through the slit. In a third form (Martin's index weighing-machine) the interior rod, instead of being graduated, is furnished with a rack on one side; this rack moves a toothed-wheel fastened on the side of the instrument; and this wheel has at one extremity of its axis a long index, which, on the wheel being put in motion, traverses a circular dial-plate, on which the graduations of weight are marked. The advantage of this last construction consists in the arrangement of the size of the toothed-wheel to that of the dial-plate, so that, since the toothed-wheel and index make a complete revolution simultaneously, a small motion of the former may produce a large motion of the latter, and the weight of the body be much more accurately indicated than can be done directly on the graduated rod. Also, there is a form of S.-B. in which the spring has a C-shape. The upper end is suspended by a ring, and the weight is suspended from the lower end. As the bowed



Spring-balance.

SPRINGBOK—SPRINGE.

spring opens, a pointer traverses a graduated arc, registering the weight. The S.-B. has one advantage over the ordinary balance, that it does not estimate unknown weight by that which is known; and is applicable therefore to determination of 'absolute' weight in all latitudes, at the equator as well as at the poles; but it has the great disadvantage of being considerably affected by change of temperature, the force of the spring to resist compression being diminished as the temperature increases at the rate of about $\frac{1}{5000}$ for each degree of Fahrenheit; consequently the apparent weights of bodies must be corrected in this proportion. The S.-B. is called also a 'dynamometer,' from its use to indicate the intensity of the forces exerted by animals or machines; for this purpose, it is attached between the force and its object, the force being applied to its object solely through the medium of the dynamometer.

SPRINGBOK, *spring'bök* (*Antilope euchore*, or *Antilocapra euchore*): species of antelope, nearly allied to the gazelles, abundant in s. Africa. It is an extremely beautiful creature, of graceful form, and fine colors. It is larger than the roebuck, and its neck and limbs much longer and more delicate. The general color is fulvous brown on upper parts, pure white beneath, the colors separated on the flanks by a broad band of deep vinous red. The whole head is white, except a broad brown band on each side from the eye to the mouth, and a brown spot in the centre of the face. Two curious folds of skin ascend from the root of the tail, and terminate near the middle of the back; they are usually closed, but open out when the animal is bounding, and disclose a large triangular white space otherwise concealed. The S. derives its name from its prodigious leaps either when alarmed or in play, often to the height of 7 ft., sometimes 12 or 13 ft. Its ordinary abode is in the *karroos* or arid sandy plains; but when all pasture there is scorched, immense herds congregate, and migrate to more fertile regions, often devastating the fields of the colonists. Pringle speaks of seeing the country near the Little Fish river specked with them as far as the eye could reach, and estimates the number in sight at once as not less than 25,000 or 30,000. Capt. Cumming describes a still more extraordinary scene, a vast herd pouring through an opening among hills, in one living mass, half a mile in breadth, and so continuing for hours together. So dense are these herds sometimes in their migrations, that the lion or the leopard, which ordinarily hangs on their skirts with a view to prey, is taken prisoner, and compelled to march along in the mass. The strongest animals are generally foremost, but when satiated with food, they fall behind, and others, hungry and active, take their place. When taken young, the S. is easily tamed, and becomes very familiar, troublesome, and tricky.

SPRINGE, n. *spring* [from Eng. *spring*; Dut. *spring-net*, a noose or net]: a noose to catch birds and game with; a spring-noose; a snare: V. to catch in a springe; to ensnare. SPRING'ING, imp. SPRINGED, pp. *springd*.

SPRINGER—SPRINGFIELD.

SPRINGER, *sprīng'ér*: kind of dog, regarded as a variety of the Spaniel (q.v.); is small, elegant, usually white, with red spots, black nose and palate, long pendent ears, and small head. Its aspect and manners are very lively. It is used by sportsmen for raising game in thick and thorny coverts. There are several breeds or sub-varieties.

SPRINGFIELD, *sprīng'fēld*: city, cap. of Sangamon co. and of the state of Ill.; on the Chicago and Alton, the Illinois Central, the Jacksonville Southeast line, the Ohio and Mississippi, the St. Louis Alton and Springfield, and the Wabash railroads; 4 m. s. of the Sangamon river, 95 m. n.e. of St. Louis, 185 m. s.w. of Chicago; 4 sq. m.; locally known as the 'Flower City.' It is in a grain-growing and general agricultural region, with valuable bituminous coal mines in its suburbs; is on a strip of beautiful prairie; is laid out in broad straight streets; and derives its name of 'Flower City' from the abundance of ornamental trees, shrubs, and flowering plants. The water-supply is from the Sangamon river. In the centre of a large and beautiful park, surrounded by its most substantial business houses, is one of the most ornate and costly capitol buildings in the United States; extreme length 399 ft., extreme depth 286 ft., height of dome 320 ft., height of lantern on dome 24 ft., total cost \$5,000,000. Other notable buildings are the U. S. custom-house and post-office (cost \$300,000); state arsenal; co. court-house; high school; public library; 4 hospitals; home for the friendless; and sev. churches. In 1901 there were 48 churches. The net public debt (1902) was \$898,700; assessed val. of all taxable prop. \$6,675,553; tax-rate \$6.90 on \$100. There were 5 nat. banks (cap. \$1,125,000); 1 state bank (cap. \$85,500); and 2 daily, 3 weekly, 3 monthly publications. The manufactories included 5 carriage and wagon factories, 6 iron-foundries, 4 planing-mills, a watch-factory which employs 1,400 hands, and sev. other minor industries. Establishments 320; cap. \$5,030,438; val. products \$6,612,286. In 1901 there were 10,214 children of school age (6-21 years), 5,816 were enrolled in pub. schools and 1,500 in priv. and parochial schools. There were 16 public school buildings; 132 teachers; school property valued at \$403,000; expenditures (including \$79,273 for teachers' salaries) \$129,136. The principal institutions for superior instruction were: Bettie Stuart Institute, Ursuline Convent School, St. Joseph's of Notre Dame (the last two Rom. Cath.), and St. Agatha's School (Prot. Episc.). Besides the public library, S. had the state law library. The most notable structure in the city, and one of national interest, is the grand obelisk, crypt, and memorial hall erected in Oak Ridge Cemetery, by popular national subscription, to the memory of Abraham Lincoln, and now containing his remains. It was designed by Larkin G. Mead, Jr., built by William D. Richardson, cost \$264,000, and besides the remains of the martyred pres. contains the remains of his sons Eddie and Willie, and his grand-

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son Abraham. The obelisk is 98 ft. 4½ in. from ground-line to apex, with 5 crypts and a memorial hall at its base. The sarcophagus of the pres. is in the central crypt, and visible through plate-glass. The pedestal supports a statue of Lincoln, groups of three figures, each representing the inf., cav., and artil. of the army, a navy group, and the U. S. coat-of-arms. The state of Ill. has bought and preserves Lincoln's home in S.—Pop. (1880) 19,743; (1890) 24,852; (1900) 34,159.

SPRINGFIELD: city, cap. of Hampden co., Mass.; on the Connecticut river, and on the Boston and Albany, the Connecticut River, the New York New Haven and Hartford, and the New York and New England railroads; 98 m. w. of Boston, 136 m. n.e. of New York; 34½ sq. m. The site is level at the river, but rises gradually toward the e.; the streets are wide, straight, and ornamented with choice shade-trees; the business, railroad, and suburban portions are connected by electric and horse street railroads; and the city is well paved, sewerred, watered, and lighted. There are 10 public parks, the largest being Forest Park, laid out 1884, and containing (1890) 336.5 acres; gas, oil, and electric light plants; 54.42 m. of sewers; and 92.3 m. of main and distribution pipes belonging to the city water-works system. In 1890 the city receipts from all sources were \$1,532,136; expenditures \$1,391,967. In 1902 the value of city property was \$6,203,190; net public debt (1902) \$2,015,700; assessed valuation of all taxable property \$74,836,065; percentage of assessment upon actual valuation 90; tax-rate \$1.45 on each \$100 of assessed valuation for all purposes. There were 46 churches—some of fine architecture—1 wood and 4 iron bridges, 9 nat. bank (cap. \$3,100,000), 3 savings-banks (surplus \$473,389), 1 corporation bank, 2 safe deposit com., and 1 daily, 7 weekly, 1 semi-monthly, 4 monthly, 1 quarterly periodical. In 1895 there were 8,002 children of school age (5-15 years), of whom 6,312 were in daily attendance at the public schools, and 1,500 at private and parochial schools; 31 public-school buildings and 207 teachers; 1 high school, with 21 teachers, 483 pupils, and 50 graduates; 1 manual-training school; 1 normal-training school; free evening draughting and drawing schools; school enrollment, 1901, 11,574; expenditures of public schools \$333,242. There are a French-Amer. Col. and a School for Christian workers. The city water-works had cost, 1890, Dec. 10, for construction \$1,382,763, real estate \$31,846, Ludlow reservoir improvement \$87,550, stock and tools on hand \$11,984—total \$1,514,143. The sources of supply were impounding reservoirs in S., Ludlow, and Belchertown, and the work of construction was begun 1864. The notable buildings are the co. court-house (cost \$500,000); union railroad depot completed 1889 (\$750,000); U. S. custom-house and post-office completed 1889 (\$150,000); city-hall, in the Romanesque style, containing a public hall with nearly 3,000 seating capacity; free public library with nearly 100,000 vols., also containing 2 museums of nat. history; U. S. arsenal, with storage capacity of 300,000 stand of

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arms; U. S. national armory, located by Washington 1794, where a large force of men is constantly employed in manufacture of breech-loading rifles, and where, during the civil war, by working day and night, more than 800,000 guns were made, at a cost of \$12,009,600; and the Church of the Unity (Unitarian), Memorial Church, North Church (Congl.), South Church (Congl.); also a fine Prot. Episc. church, and the Cathedral of St. Michael (Rom. Cath.). In 1900 there were 817 manufacturing establishments, which had \$17,105,947 capital and \$21,207,039 products. The principal manufactures now are army-rifles, sporting arms, revolvers, cotton and woolen goods, paper, envelopes, watches, knit goods, railroad cars, sewing-machines, corrugated iron, paints and chemicals, spectacles, furniture, buttons, engines, and carriages and wagons. S. was settled 1635, was long known by the Indian name Agawam, received its present name 1640, was burned by the Indians during King Philip's war 1675, and became a city 1852. Pop. (1890) 44,164; (1900) 62,009.

SPRINGFIELD: city, cap. of Greene co., Mo.; on the Kansas City Fort Scott and Gulf, and the St. Louis and San Francisco railroads; 130 m. s. of Jefferson City, 243 m. w.s.w. of St. Louis. It is on the summit of the Ozark Mountains, and, being the trade centre for all of s.w. Mo. and n. Ark., has had rapid growth. The region is developing some of the richest zinc and lead mines in the world. The city has a remarkably mild and healthful climate, and has spent large sums in local improvements and to aid railroad construction. Both railroad companies, under local inducements, have located their repair and machine shops here, the Kansas City Fort Scott and Gulf having a plant that cost \$300,000, and the St. Louis and San Francisco one that cost nearly \$1,000,000. There is a public park and a little s. of the city there is a national cemetery containing the graves of more than 2,000 Union and Confederate soldiers. S. has excellent water-supply from a spring in the mountains, is laid out with regularity, has gas and electric lights, 6 m. of street railroad, and 30 m. of water mains, and does a large manufacturing business. On 1903, Feb. 1, the total debt was \$192,000, floating debt \$6,000, sinking fund \$32,000, net debt \$160,000; total assessed valuation \$8,087,760, of which \$5,707,476 was real and \$2,380,284 personal property; tax rate \$9.70 per \$1,000. There were 40 churches, with property valued at \$700,000. During the school year 1895 there were 6,470 children of school age (6-20 years), of whom 5,071 were enrolled in the pub. schools, and 600 in private and parochial schools. There were 12 public-school buildings, with accommodations for 4,620 pupils; 47 teachers; school property valued at \$182,694; receipts and available funds, \$52,593; expenditures (including \$27,305 for teachers' salaries) \$49,479. In 1901 the enrollment in public schools was 5,469; teachers 79. There was also one col. of liberal arts, Drury Col., for both sexes (Congl.), opened 1873, which had 21 instructors, 360 students (192 male, 168 female), 25,100 vols. in

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its library, \$200,000 invested in grounds and buildings, \$235,000 in productive funds and \$22,800 income besides that from board and lodgings. In 1902 there were 2 national banks (cap. \$200,000), 5 state banks, 1 private bank (cap. \$725,000), and 3 daily, 5 weekly, 2 semi-monthly, and 3 monthly periodicals. There were (1900) 245 manufacturing establishments, with cap. of \$2,111,048, and 2,127 wage earners, val. products, \$4,126,871. There were 9 tobacco factories, 4 flour mills, 3 lumber mills, 2 brush and broom works, 4 carriage factories. The city was incorporated in 1831, and during the Civil war was in the possession alternately of the Federal and Confederate forces. The battle of Wilson's Creek (Aug. 10, 1861) occurred in the vicinity. S. is the seat of a U. S. dist. court and of a U. S. land office, has a fair assoc. with land and buildings valued at \$250,000, and 1887 built a \$75,000 opera-house. Pop. (1890) 21,850; (1900) 23,267.

SPRINGFIELD: city, cap. of Clarke co., O.; on Mad river, and on the Cincinnati Sandusky and Cleveland, the Cleveland Cincinnati Chicago and St. Louis, the Columbus Springfield and Cincinnati, the Erie, the Ohio Southern, and the Pittsburgh Cincinnati Chicago and St. Louis railroads; 43 m. w. of Columbus; 6 sq. m. It is in a naturally rich and well-cultivated region; has abundant water-power from Mad river and Lagonda creek; and ranks first among American cities in manufacture of agricultural implements. In 1902 it had net public debt \$798,810; assessed valu. of all taxable prop. \$18,246,800; tax-rate \$9.85 on \$100; 5 nat. banks (cap. \$1,000,000); 1 state bank for savings (cap. \$76,000, deposits \$1,100,000); 4 daily, 7 weekly, 1 semi-monthly, and 4 monthly periodicals. There were 50 churches; co. court-house (cost \$125,000); new city-hall (cost \$225,000); Masonic Home; new U. S. custom-house and post-office (\$150,000); pub. library (cost \$100,000); lyceum; free hos.; 2 opera-houses; more than 20 m. of macadamized roads leading to the suburbs; 30 m. of street railroads; gas and electric-light plants; board of trade; and water-works (cost \$500,000). In 1895 there were 9,296 children of school age (6-21 years), of whom 5,656 were enrolled in the public schools, and 1,400 in private and parochial schools, and of the former 3,912 were in average daily attendance. There were 15 public-school buildings; school property valued at \$330,000; 123 teachers; receipts and available funds \$184,743; expenditures (including \$67,707 for teachers' salaries) \$113,988; 1 high school; Springfield Seminary for both sexes (non-sect.), opened 1874, 4 Catholic schools, 2 business colleges, and 2 kindergartens. S. is the seat of Wittenberg College and Wittenberg Theological Seminary, both Lutheran, opened 1845, and under the presidency of the Rev. S. A. Ort, D.D. The college had 21 instructors, 2 endowed professorships, 297 students, 21,000 vols. in the library, \$250,000 invested in grounds and buildings, \$175,000 in productive funds, and income from all sources excepting board and lodging \$22,293.

SPRINGHALT—SPRINTING.

The theol. seminary had 4 instructors, 5 endowed professorships, 22 students, 10,000 vols. in the library, \$140,000 invested in grounds and buildings, \$175,000 in endowment funds. The manufactures of agricultural implements, which exceeded \$10,000,000 in value in 1889, and in 1900 amounted to \$5,272,636, 7 firms) include reapers, mowers, self-binders, grain-drills, threshing-machines, cultivators, seeders, plows, barrows, and other articles. Other important manufactures are traction and gas engines, boilers, various kinds of cycles, metal-working machinery, steam-pumps, carriages and wagons, several forms of malleable iron, wind engines, furnaces, cigars, flour, feed-grinding mills, iron fences, lawn-mowers, etc. There were establishments which employed more than 6,000 hands, and produced nearly 120 different articles. S. was laid out 1801, became the co. seat 1819, and began to be noted as a manufacturing centre 1860. Pop. (1880) 20,730; (1890) 31,895; (1900) 38,253.

SPRINGHALT, *n.* *spring'hawlt* [*spring*, and *halt*]: see **STRINGHALT**.

SPRINGS, MECHANICAL: elastic material applied in very various forms for different purposes. The simplest form is a piece of elastic metal wire, rolled on a mandrel, forming a continuous single cylindrical coil of any length needed. Clock and watch springs are flat coils of thin bands of steel. The *balance-spring* of watches is of fine wire often thinner than hair. Coach-springs are formed of a series of curved narrow plates of steel of different sizes, placed one over another, the largest at the bottom, and the others in regular succession according to size—the whole held together with nuts and screws. These are some of the commonest forms, but very many others are in use.

SPRINKLE, *v.* *spring'kl* [Dut. *sprenkelen*, to sprinkle: Ger. *sprenkeln*, to mark with scattered spots: Sw. *sprackla*, speckled, freckled]: to scatter; to disperse; to scatter a liquid; to cleanse or purify by sprinkling: *N.* a small quantity scattered. **SPRINKLING**, *imp.* *-kling*: **ADJ.** scattering in small drops: *N.* a small quantity scattered in drops; a small number distributed among a large. **SPRINKLED**, *pp.* *spring'kld*.

SPRINTING, *sprint'ing*: term in amateur and professional sport, denoting short-distance foot-race, run at full speed. S. in the United States has become the most popular form of foot-racing, and has distinct rules and records. As a sprint-race is a steady spurt from line to tape, the distance must be short. The most approved distance is 100 yards, but some professionals prefer 120–130 yards, and others a quarter m. or 440 yards. A special training is required for S., and much more than usual depends on the form or style of the start. The best records (1891) were—amateur: 50 yards, L. E. Myers (U. S.), 5½ sec.; 75, the same, 7½ sec.; 100, L. H. Cary (U. S.), 9½ sec.; 125, C. H. Sherrill (U. S.), 9¾ sec.; 150, C. G. Wood (Eng.), 14½ sec.; and 440, H. C. L. Tindall, 48½ sec.:—professional: 50 yards, H. M. Johnson (U. S.), 5¼ sec.; 75, the same, 7¾ sec.; 100, H. Bethune,

9 $\frac{1}{5}$ sec.; 150, H. Hutchens (Australia), 14 $\frac{1}{5}$ sec.; and 440, R. Buttery, 48 $\frac{1}{5}$ seconds. The best mile—too long to be called a sprint, though S. was done in it—was done by W. G. George (Eng.), in 4 min. 18 $\frac{2}{5}$ sec., as an amateur, and in 4 m. 12 $\frac{3}{5}$ sec. as a professional. In the United States 8 amateurs, and in England 1, had sprinted 100 yards in 10 seconds. Cary (U. S.) and Wood (Eng.) are tied on the 220-yard dash, 21 $\frac{1}{5}$ sec.; and on the 600-yard the best English record 1891 was 1 min. 12 sec., and the best U. S., 1 min. 11 $\frac{2}{5}$ seconds.

SPRIT, v. *sprīt* [Norw. *spretta*, to split, to spring asunder or shoot like leaves: Dut. *spriet*, a piece of cleft wood, a spear, a bowsprit: Dan. *sprød*, a sprit]: to sprout; in *OE.*, to throw out with force from a narrow orifice: N. a sprout; a shoot. In a vessel, a diagonal yard or spar, crossing and sustaining a quadrilateral (usually square) fore-and-aft-sail: the sprit's heel is held on the mast in a ring of rope, called a 'snotter,' and its head reaches to the after upper corner of the sail. BOWSPRIT, n. *bō'sprīt*, large boom or spar which projects over the stem of a ship or boat to carry sail forward (see BOWSPRIT, under Bow). SPRIT-SAIL, sail extended over the stem of a ship or boat.

SPRITE, n. *sprīt* [a corruption of SPIRIT: F. *esprit*, spirit]: a spirit; a shade.

SPROAT, *sprôt*, EBENEZER: 1752–1805, Feb.: b. Middleborough, Mass.: soldier. He became a capt. in the provincial army 1775; was promoted maj., lieut.col., and col. of the 2d Mass. regt.; was in Glover's brigade at the battles of Trenton, Princeton, and Monmouth; and was brigade-inspector under Baron Steuben. After the war he engaged in surveying in Providence; in 1786 began the survey of the O. territory; and 1788 was at the head of the emigrants that settled Marietta, where for 14 years he was sheriff and col. of militia.

SPROD, n. *sprød* [Gael. *bradan*, a salmon: perhaps only a corruption of *sprout*, and also see SPRAT]: a salmon in its second year.

SPROUT, v. *sprout* [akin to *spurt*, *sputter*, and *spirt*: Dut. *spruiten*, to sprout: Dan. *sprutte*; Ger. *sprudeln*, to spurt, to spout]: to bud or germinate; to grow like buds or shoots of plants: N. the shoot or bud of a plant. SPROUT'ING, imp.: ADJ. germinating: N. the act of shooting or germinating. SPROUT'ED, pp. SPROUTS, n. plu. young coleworts. BRUSSELS SPROUTS, coleworts whose prominent leaf-buds are used for culinary purposes—so called because the best seed is obtained from Belgium.

SPRUCE, a. *sprós* [Icel. *sparkr*, brisk, lively: Gael. *spruiseil*, neat, trim: Sw. *spricka*, to shoot: Swiss, *sprützen*, to spring with elastic force]: neat or fine in dress; trim; foppish: V. to dress with affected neatness. SPRUC'ING, imp. SPRUCED, pp. *spróst*. SPRUCE'LY, ad. -*lī*. SPRUCE'NESS, n. -*nēs*, the state or quality of being spruce; trimness. To SPRUCE UP, to dress neatly; to trim.

SPRUCE—SPUME.

SPRUCE, n. *sprós* [Ger. *sprossen*, sprouts, especially of a species of fir, a decoction of which was formerly much in use on the shores of the Baltic as remedy for scorbutic and other diseases]: name given to several kinds of fir trees (see **FIR**). **SPRUCE-BEER**, liquor flavored with the essence of spruce. This essence is obtained by boiling the green tops of the Black Spruce (*Abies nigra*), Norway Spruce (*Picea excelsa*), and perhaps other varieties, in water, and then concentrating the decoction by another boiling without the spruce-tops. The young shoots of this fir, like most of its family, are coated with a resinous exudation, which is dissolved in the water. The beer is made by adding the essence of spruce to water in which sugar or molasses has been dissolved, in proportion of about four ounces of essence of spruce to ten lbs. of sugar or three quarts of molasses, and 10 or 11 gallons of water, with about half a pint of yeast. Various spices are used for flavoring. Spruce beer is of some use as an antiscorbutic; and the Antiscorbutic Beer of the Russian Army Pharmacopœia is made by mixing spruce-tops and fresh horseradish root with common beer—ginger and *Calamus aromaticus* being added for flavoring, and, after fermentation, a little cream of tartar, tincture of mustard, and proof-spirit.

SPRUE, n. *spró* [etym. doubt.]: the ingate of a mold, through which the metal is poured; the piece of metal attached to a casting, occupying the gate through which the metal was poured; a piece of metal or wood used by a molder in making the ingate through the sand.

SPRUNG, *sprüng*: pt. and pp. of **SPRING**, which see.

SPRY, a. *sprī* [a softened pronunciation of *sprag* 2 or *sprack*: prov. Sw. *sprygg*, skittish]: nimble; active; alert.

SPUD, n. *spūd* [Dan. *spyd*, a spear: Sw. *spode*, a rod: Norw. *spode*, *spuda*, a stick for turning bread in the oven: perhaps a mere corruption of *spade*]: a narrow spade used for destroying weeds; a short thick concave blade with wooden handle for grubbing up specimens in botanizing; a short thick thing, in contempt; *vulgarly*, a potato.

SPUE, v. *spū*: a common spelling of **SPEW**, which see. **SPU'ING**, imp. **SPUED**, pp. *spūd*.

SPULLER, n. *spāl'ler* [for *spooler*—from **SPOOL**, which see]: one employed to inspect yarn.

SPULYE, or **SPULYIE**, or **SPULZIE**, n. *spāl'yī* [F. *spolier*—from L. *spoliāre*, to spoil]; in *Scot.*, to lay waste; to carry off; to spoil: N. spoil; in *Scots law*, illegal interference with movable property.

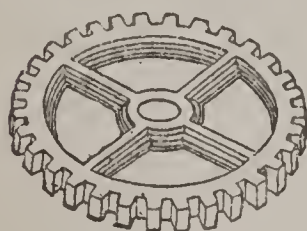
SPUME, n. *spūm* [L. *spūma*, foam, froth—from *spuērē*, to spit]: froth; foam; scum: V. to froth; to foam. **SPU'MING**, imp. **SPUMED**, pp. *spūmd*. **SPUMY**, a. *spū'mī*, or **SPU'MOUS**, a. *-mūs*, consisting of froth or scum; frothy. **SPUMESCENCE**, n. *spū-mēs'sēns*, frothiness. **SPUMIF'EROUS**, a. *-māf'ēr-ūs* [L. *fero*, I bear]: producing foam.

SPUN—SPURGE.

SPUN, v. *spŭn*: pp. of **SPIN**, which see. **SPUN-HAY**, hay twisted into ropes. **SPUN-GOLD**, n. a flattened silver-gilt wire, wound on a thread of yellow silk. **SPUN-SILK**, n. cheap article produced from short-fibred and waste silk; frequently mixed with cotton. **SPUN-SILVER**, n. thread of coarse silk or singles, wound with flattened silver wire. **SPUN-YARN**, rope yarn twisted into a rope.

SPUNK, n. *spŭngk* [Ir. and Gael. *sponc*, sponge, touchwood: L. *spongia*; Gr. *sponggia*, a sponge—touchwood being so called from its porous nature]: wood that readily takes fire; touchwood; spirit; mettle; vivacity; in *Scot.*, a spark; a lucifer-match. To **SPUNK OUT**, to come to light; to be discovered. **SPUNK'Y**, or **SPUNK'IE**, a. -*ŷ*, quick; spirited; irritable.

SPUR, n. *spër* [A.S. *spura*, a spur: Ger. *sporn*; Sw. *sporre*; Dan. *spore*; Dut. *spoor*, a spur]: instrument having a small wheel with sharp points, worn on the heels of a horseman's boots, for goading a horse to further speed: it is used much less than formerly. All cavalry soldiers wear spurs; but their use, except in the heat of an actual charge, is discouraged as much as possible. In the days of chivalry, the use of the spur was limited to knights, and it was among the emblems of knighthood. To win the spurs was, in the days of chivalry, to earn knighthood by gallant conduct: thence, as in modern phrase, to gain the desired honors or rank. The degradation of a knight involved the hacking off of his spurs. The serving before a knight of a pair of spurs on a dish was a strong hint by his host that he had outstayed his welcome.—In general, spur denotes any incitement or stimulus to increase effort: the sharp horny projection on a cock's leg: the largest and leading root of a tree: any projecting appendage of a flower or blossom having the appearance of a spur: ergot: anything standing out; a mountain branching from a range; anything resembling a spur: V. to incite or urge forward with a spur; to urge to more vigorous action: to incite; to impel; to press forward. **SPUR'RING**, imp.



Spur-wheel.

SPURRED, pp. *spërd*: **ADJ.** wearing or having spurs; affected with spur or ergot, as *spurred* rye. **SPUR'LESS**, a. -*lës*, without a spur. **SPURRIER**, n. *spŭr-rĭ-ër*, one who makes spurs. **SPUR-WHEEL**, a wheel having cogs around the rim, but pointing toward its centre. **SPUR-GALL**, v. to gall or wound with a spur. **SPUR'-GALLED**, imp. -*gawld*: **ADJ.** galled or wounded with the spur. To win his spurs, to gain the rank of knighthood and the gift of spurs: thence to gain the academic honors or social position aimed at.

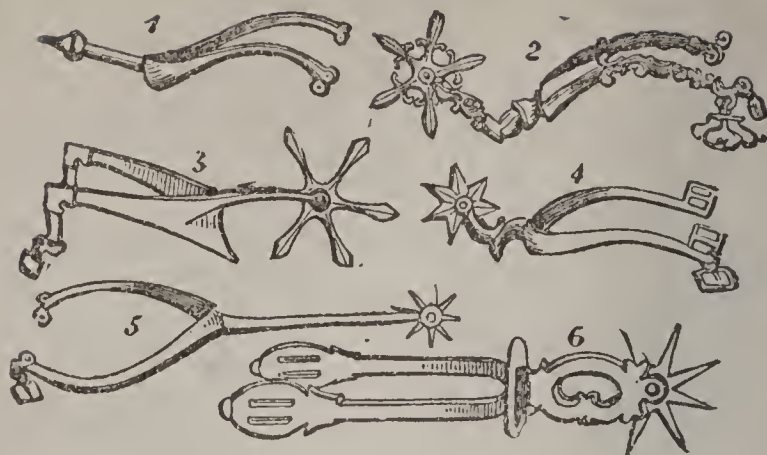
SPURGE, n. *spërj* [OF. *spurge*, *espurge*, garden-spurge; *espurger*, to purge, to cleanse—from L. *ex*, out, thoroughly; *purgo*, I purge], (*Euphorbia*): genus of plants of nat. order *Euphorbiaceæ*, having monœcious naked flowers, male flowers membranous and surrounding a tricoccus stalked female flower, the whole placed within a cup-shaped in-

SPURGEON.

volucere. The fruit has three valves and three cells, the cells one-seeded and bursting elastically. The species are very numerous, natives of warm and temperate climates, mostly herbaceous, but some woody. All contain a resinous milky juice, which in most is very acrid. SPURGE-LAUREL, the *Daphnē laureōla*, ord. *Thymel'acēcēæ*, whose berries are poisonous (see DAPHNE).

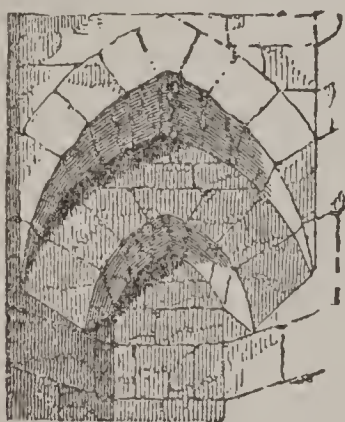
SPURGEON, *spér'jon*, CHARLES HADDON: 1834, June 19—1892, Jan. 31; b. Kelvedon, Eng.: Bapt. minister. tended by his family for a Congl. minister, his own sentiments inclined to the Baptists (who in England are mostly 'open-communion' in views and practice), and he joined their connection 1850. He became at once an active tract-distributor and school-teacher; and, removing to Cambridge 1851, began to deliver cottage sermons in the neighborhood. The popularity of the 'boy-preacher' was almost immediately established; and at the age of 18 he had charge of a small Bapt. congregation in the village of Waterbeach. In 1854 he entered on the pastorate of the New Park Street Chapel, London, where his preaching was so attractive that in two years the building had to be greatly enlarged. His audience continuing to increase, the Surrey Music Hall was for some time engaged for his services; and finally his church built for him his well-known 'Tabernacle' in Newington Butts. This immense structure cost more than \$155,000, and was opened 1861. With the Tabernacle are connected more than 30 religious and philanthropic enterprises, nearly all the outgrowth of S.'s suggestions and under his direction: they include the Stockwell Orphanage, the Pastor's College, training hundreds of young men for the ministry, the Colportage Assoc., the Book Fund, the Supplementary Pastor's Aid Fund, and socs. for evangelistic work in Britain and in n. Africa. Since 1855 his sermons have been published weekly, and now (1892) have a sale of about 25,000 each, besides various foreign translations. In 1879 S. was presented with a silver-wedding testimonial of more than \$30,000, and 1884, on reaching his 50th year, was given \$25,000: the greater part of both sums he applied to the work of the Tabernacle.

S., though fervently evangelical, held to the older and severer lines of theologic thought; and in recent years was gravely apprehensive lest, in the popular drift of his own and other denominations toward a less stringent use of the ancient terms, there might be concealed or involved a departure from the fundamental truths of the gospel. To give effect to his protest, in 1887 he withdrew from the Bapt. Union of Great Britain—not from the Bapt. connection; and his action gave rise to a spirited controversy in the papers, under the title, 'The Down Grade Question.' Those from whom he separated averred that he quite misunderstood their position; but while expressing their regret for this, they abated nothing of their affection for him and admiration of his noble work.—He was given a great reception on the publication of his 2,000th sermon, 1888, Jan. In recent years he suffered with repeated attacks of sickness, and in 1891 was prostrated with a



Various Kinds of Spurs. (From Antiquarian Museum, Edinburgh.)

1, bronze prick spur found at Linlithgow Palace; 2, iron spur found near Bannockburn; 3, bronze spur found at Colchester; 4, brass spur found at Culloiden; 5, spur found at Halidon Hill; 6, spur found in making a drain in High Street, Edinburgh.



Squinch, Maxstoke Priory, Warwickshire.



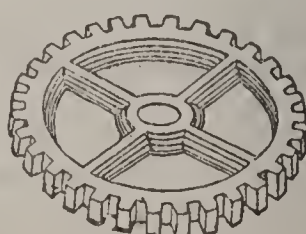
Staith.



Stalactites and Stalagmites.



Stag Beetle (*Lucanus cervus*).



Spur-wheel.

SPURIOUS—SPURT.

long and severe illness, from which he appeared to be rallying toward the end of 1891. He published *John Ploughman's Talk*, *Morning by Morning*, *Evening by Evening*, *The Treasury of David* (an extended practical treatment of the Book of Psalms), *Lectures to my Students*, *The Saint and His Saviour*, two vols. of proverbs entitled *Salt-cellers* (1890); and after 1865 edited a monthly magazine, *The Sword and the Trowel*. He died 1892, Jan. 31.

SPURIOUS, a. *spū'ri-ūs* [L. *spurius*, spurious: It. *spurio*]: not real or genuine; not proceeding from the true source; counterfeit; false. **SPURIOUSLY**, ad. *-lī*. **SPURIOUSNESS**, n. *-nēs*, the state or quality of being spurious or not genuine.—**SYN.** of 'spurious': counterfeit; adulterate; false; fictitious; bastard; supposititious; sophisticated.

SPURN, v. *spěrn* [AS. *speornan*, to kick: Icel. *sperna*, to kick: Gael. *spairn*, an effort: L. *spernĕrĕ*, to despise]: to drive back, as with the foot; to reject with disdain; to manifest disdain or contempt in rejecting anything: N. in *OE.*, disdainful rejection; a kick; insolent and contemptuous treatment. **SPURN'ING**, imp. **SPURNED**, pp. *spěrnd*. **SPURN'ER**, n. *-ēr*, one who spurns.

SPURN HEAD, *spěrn hĕd*: extreme point of a long, low, narrow, and shingly peninsula in s.e. Yorkshire, England; at the mouth of the Humber, 24 m. s.e. of Hull. Two light-houses have been built here, one of which is in lat. 53° 34' 7" n., long. 0° 7' 2" e.

SPURRIER: see under **SPUR**.

SPURRY, or **SPURREY** n. *spŭr'ri* [OF. *spurrie*; Ger. *spörgel*, spurry: new L. *spergŭla*]: plant of genus *Spergŭla*, ord. *Illecebrăcĕæ*, but variously ranked by botanists. It is an annual, dichotomously branched, or with whorled branches; leaves linear-filiform, in clustered whorls, with membranaceous stipules; flowers in terminal divaricating corymbs. The flowers have a calyx of five sepals, five white petals, five or ten stamens, and five styles; the capsule is five-valved, with numerous round seeds, surrounded with a membranous border. There are 2 or 3 species of *Spergula* common to temperate regions of both the e. and w. hemispheres. **COMMON S.**, or **YARR** (*S. arvensis*), is plentiful in corn-fields, especially on light stony or sandy soils. In some parts of Europe, a larger variety is frequently sown for fodder, and is relished by cattle; and in Germany the S. is cultivated sometimes to be plowed into sandy soils.

SPURT, n. *spĕrt* [see **SPROUT**: Dut. *spruiten*, to sprout: Sw. *spruta*, to spirt: Gael. *spairt*, a splash, a drop): a forcible ejection, suddenly or repeated at intervals, of a liquid substance from a tube or small opening; a jet; a great or sudden effort: V. to throw out forcibly in a stream, as water; to rush or issue out, as jet, suddenly or at intervals. **SPURT'ING**, imp. **SPURT'ED**, pp. **SPURTLE**, v. *spřĕt'l*, to issue out in a scattering manner: N. in *Scot.*, a short rod used to stir porridge while cooking. **SPURT'LING**, imp. *-lĭng*. **SPURTLED**, pp. *spĕrt'ld*; also **SPIRT** and **SPIRTLE** in the same sense: see **SPIRT**.

SPURZHEIM—SPUTUM.

SPURZHEIM, *spûrts'hîm*, JOHANN GASPAR: German physician and phrenologist: 1776, Dec. 31—1832, Nov. 10; b. Longwich, near Treves. While studying medicine at Vienna, he was introduced to Dr. F. J. Gall (q.v.), whose pupil, and afterward colleague, he became, in investigating the structure and functions of the brain (see PHRENOLOGY), in lecturing on the subject, and in writing for the press. In 1807 they settled in Paris, but parted 1813; and next year S. went to England, where he published *The Physiological System of Drs. Gall and S.* (London 1815), *Outlines* of the same (1815), and a treatise on *Insanity* (1817). The first of these works having been severely handled by Dr. John Gordon in *Edinburgh Review*, No. 49, S. proceeded to Edinburgh, and, in the lecture-room of his critic, demonstrated the reality of the anatomical discoveries which had been denied and ridiculed. To the same and other opponents, he replied in *An Examination of the Objections made in Britain against the Doctrines of Gall and S.* (Edinburgh 1817). It was about this time, and under his tuition, that George Combe (q.v.) became a student of phrenology. After lecturing in many British and Irish cities, S. returned 1817 to Paris; but from 1825 till his death, he resided much in England, teaching and defending his opinions in lectures and books. In 1832 he went to America for the same purpose, and began his labors at Boston, but was cut off by fever in that year. Besides the English works above mentioned, he wrote: *Elementary Principles of Education* (Edinburgh 1821; 2d ed. Lond. 1828; French translation, Paris 1822); *Phrenology* (Lond. 1825); *Philosophical Principles of Phrenology* (1825); *Phrenology in Connection with the Study of Physiognomy* (1826); *Anatomy of the Brain* (1826), supplemented 1829 by an Appendix, with *Remarks on Charles Bell's Animadversions on Phrenology*; *Outlines of Phrenology* (1827); and *Sketch of the Natural Laws of Man* (1828). Some of these were reprinted at Boston. His French works (besides those written jointly with Gall) are: *Obs. sur la Folie* (Paris 1818); *Obs. sur la Phrénologie* (1818); *Essai Philosophique sur la Nature Morale et Intellectuelle de l'Homme* (1820); and *Manuel de Phrénologie* (1832). See *Phren. Jour.*, VIII. 126; *For. Quart. Rev.*, II. 15; *Memoir of S.*, by A. Carmichael (Dublin 1833); and Combe's *System of Phrenology*.

SPUTCHEON, n. *spûch'on* [etym. doubt.]: the inner part of the mouthpiece of a sword scabbard, which retains the lining in place.

SPUTTER, v. *spût'tér* [closely allied to SPOUT and SPIT: Low Ger. *sputtern*; Norw. *sputra*, to sputter, to spurt]: to spit in scattered drops, as in rapid speaking; to throw out liquid matter in scattered portions; to utter with hasty indistinctness: N. moist matter thrown out in particles or drops; stir; noise. SPUT'TERING, imp. SPUT'TERED, pp. -têrd. SPUT'TERER, n. -têr-êr, one who sputters.

SPUTUM, n. *spû'tûm* [L. *sputum*, spittle—from *spuërë*, to spit]: in *med.*, the matter discharged from the mouth in disorders of the breathing organs; spittle.

SPUYTEN DUYVIL CREEK—SPY.

SPUYTEN DUYVIL CREEK, *spī'tn dī'vīl krīk*: narrow tidal channel connecting the Hudson river with the Harlem, and through the Harlem with the East river and Long Island Sound. It forms the n. boundary of Manhattan Island, and is within the city limits. Being subject to sudden gusts of wind it was formerly considered dangerous for sailing-vessels, and is said to take its name from the remark of an old Dutch shipmaster, who, on being warned not to attempt to pass through it, replied that he would go through 'in spite of the devil.'

SPY, n. *spī* [OF. *espier*; It. *spiare*; Ger. *spähen*; L. *specēre*, to look, to watch: OHG. *spehon*, to look, to spy]: one who secretly watches the conduct, condition, etc., of a person, in order to report them to another; a secret agent; an emissary; one who in war enters an enemy's lines to discover and report his strength and plans: V. to discover at a distance; to gain sight of; to inspect or examine secretly; to find out by artifice; to play the spy. SPY'ING, imp. SPIED, pp. *spīd*. SPY-GLASS, a small telescope.—*Spy*, in war, is a useful though not always highly honored auxiliary, employed to ascertain the state of an enemy's affairs, and his intended operations. Spies have been used in all wars from the earliest times. Their employment is quite recognized by the law of nations as interpreted by Grotius, Vattel, and Martens; and it is not held to be the least dishonor to a general to avail himself of their services. Yet the spy himself is dealt with, by those against whom his work is directed, as an outlaw and as devoid of honor. If taken by the enemy, he is put to death ignominiously and without mercy. As the work is so dangerous, and so little redounds to honor, it is never permissible for a general to compel by threats any person, whether of his own or the hostile party, to act as spy; but he is at liberty to accept all such services when proffered. A spy is well paid, lest he betray his employer. Martial law, though distinct enough in ordering the death of a spy, is not clear in defining what constitutes a spy. A man—not of the enemy—within the enemy's lines, and in the enemy's uniform, would presumably be a spy: if in civil dress, and unable to give good account of himself, his chance of hanging would be considerable; but if found in one camp in the uniform of the opposite side, he is not to be treated otherwise than as a prisoner of war, or as a deserter from the enemy.

Both as regards honor and penalties, it seems that spies ought in fairness to be divided into two classes—first, those who betray their own country to an enemy; secondly, those who, being enemies, contrive surreptitiously to obtain information by penetrating into the opposing army. The first class are traitors in the strictest sense, and may fairly be adjudged worthy of an ignominious death; but the second class are often brave men, who risk all that a man has to lose in the service of their country. It is unfair to accord them the same treatment as the traitors.

SQUAB—SQUALL.

SQUAB, a. *skwōb* [imitative of the sound made by the fall of a soft lump: Ger. *quabbelig*, squab; *quabbeln*, to shake (see **QUAVER**)]: fat; plump; bulky; unfledged: N. anything thick and soft; a soft stuffed cushion; a thick fat person; an unfledged bird or nestling: AD. with a heavy sudden fall, plump and flat. **SQUAB'BY**, a. *-bī*, thick; fat; heavy. **SQUAB-PIE**, a pie made of squabs or young pigeons, or one made of meat, apples, and onions.

SQUABBLE, n. *skwōb'bl* [imitative of the dashing of water: Sw. *kabbla*, to wrangle: Norw. *svabba*, to splash: Ger. *schwabbeln*, to shake to and fro]: a low quarrel; a scuffle; a brawl: V. to contend; to wrangle. **SQUAB'BLING**, imp. *-bling*: N. the act of one who engages in a wrangling debate or petty quarrel. **SQUABBLED**, pp. *skwōb'bl'd*. **SQUAB'BLER**, n. *-blēr*, one who squabbles.—**SYN.** of 'squabble, v.': to contend; dispute; wrangle; scuffle; struggle; quarrel; brawl; fight.

SQUAD, n. *skwōd* [F. *escouade*, a small body of men: Sp. *escuadra*; It. *squadra*, a troop or square of soldiers (see **SQUARE**)]: a group; a company; small party of soldiers assembled for drill or inspection—a troop or company of soldiers being divided into as many squads as there are officers or sergeants at hand to drill them. **AWKWARD SQUAD**, those recruits not yet fitted to take their places in the regimental line; also soldiers who have proved themselves so deficient and clumsy in drill as to be sent back to the lowest squad to be redrilled. **SQUAD-BAG**, a black canvas bag, allowed to every 25 men in the field or on march, to contain extra articles of attire, etc.

SQUADRON, n. *skwōd'rōn* [OF. *esquadron*; It. *squadron*; Sp. *escuadron*, a squadron (see **SQUAD**)]: *primarily*, a body of troops drawn up in a square or in any form; the chief division of a regt. of cavalry, consisting of two troops—the number of squadrons in a regt. numbering three or four. The S. is the unit by which the force of cavalry with an army is always computed. In the U. S. army (1891) there were 10 cav. regts. of 12 companies or troops each, with an aggregate of 70 men to the co., and a separate troop of 69 men. In *naval affairs*, a detachment of a fleet, comprising not less than four vessels, and constituting the command of a flag-officer. **SQUAD'RONED**, a. *-rōnd*, formed into squadrons.

SQUALID, a. *skwōl'id* [L. *squalidus*, filthy; *squalērē*, to be filthy: It. *squallido*]: poverty-stricken; extremely dirty. **SQUAL'IDLY**, ad. *-lī*. **SQUAL'IDNESS**, n. *-nēs*, the state or quality of being squalid. **SQUAL'OR**, n. *-ēr* or *squā'lēr* [L. *squālor*, dirtiness]: foulness; filthiness.

SQUALL, v. *skwawl* [Icel. *squala*, to scream: Dan. *squalder*, noisy talk: Sw. *squallra*, to tattle]: to cry out; to scream: N. a loud scream or cry. **SQUALL'ING**, imp. ADJ. crying out harshly; screaming. **SQUALLED**, pp. *skwawld*.

SQUALL—SQUANDER.

SQUALL, n. *skwawl* [prev. Sw. *squala*, to gush out with a violent noise: Sw. *squal*, a rush of water]: a sudden storm of wind and rain. **SQUALL'Y**, a. -*ī*, abounding in sudden and violent gusts of wind. **BLACK SQUALL**, sudden and violent gusts of wind accompanied with rain and dark heavy clouds. **WHITE SQUALL**, a squall without rain and dark clouds. **TO LOOK OUT FOR SQUALLS**, to be on one's guard; to be on the watch.

SQUALOID, a. *skwā'loyd* [L. *squalus*, a shark; Gr. *eidos*, resemblance]: resembling or pertaining to the Shark family. **SQUALIDÆ—SQUALUS**: see **SHARK**.

SQUALOR: see under **SQUALID**.

SQUAM, *skwām*, **LAKE**, or **LAKE ASQUAM**, *ās-skwām'*: singularly picturesque lake in N. H., about 3 m. n.w. of Lake Winnepesaukee, 6 m. e. of Plymouth. It is about 8 m. long and 5 m. wide, and has a great number of beautiful wooded islands. It receives the outlet of White Oak Pond (1 m. long) on the e.; and its waters flow through a short outlet into Little Squam Lake (2 m. long), and through this and Squam river into the Pemigewasset, one of the chief feeders of the Merrimack. It is navigated by small pleasure steamers. Its waters are clear. S. Lake is, in dimensions, the second lake in N. H.; and probably, outside of Maine, the second lake wholly comprised within New England.

SQUAMA, n. *skwā'mă*, plu. **SQUA'MÆ**, -*mē* [L. *squāma*, a scale of a fish or serpent]: in *bot.*, a scale; a part arranged like a scale. **SQUA'MOSE**, a. -*mōs*, or **SQUA'MOUS**, a. -*mūs*, scaly; covered with scales; having a scale-like aspect, structure, or arrangement; in *anat.*, applied to a portion of the temporal bone. **SQUAMOSAL**, a. *skwā-mō'sāl*, applied to one of the bones of the skull in the lower vertebrata, answering to the *squamous* portion of the temporal bone. **SQUA'MIFORM**, a. -*mī-fawrm* [L. *forma*, a shape]: having the form of scales. **SQUAMIGEROUS**, a. *skwā-mī'ēr-ūs* [L. *gero*, I bear]: bearing or having scales. **SQUAMATA**, n. plu. *skwā-mă'tă*, the division of reptiles in which the integument develops horny scales. **SQUAMATE**, a. *skwā'măt*, scale-like; scaly.

SQUAMIPEN'NES: see **CHÆTODONTIDÆ**.

SQUAMULÆ, n. plu. *skwā'mū-lē* [dim. of L. *squāma*, a scale]: in *bot.*, minute membranous scales, occurring in the flowers of grasses; lodicules. **SQUAMULOSE**, a. *skwā'mū-lōs'*, having minute scales.

SQUANDER, v. *skwōn'dēr* [a nasalized form of Scot. *squatter*, to splash or spill a liquid, to disperse: Dan. *squatte*, to splash, to spirt, to squander: Sw. *squättra*, to squander]: to spend profusely or wastefully; to spend without economy or judgment. **SQUAN'DERING**, imp.: **ADJ.** prodigal; wasteful. **SQUAN'DERED**, pp. -*dērd*: **ADJ.** scattered; spent lavishly and wastefully. **SQUAN'DERER**, n. -*dēr-ēr*, one who squanders. **SQUAN'DERINGLY**, ad. -*lī*.—**SYN.** of 'squander': to waste; scatter; disperse; dissipate; expend; spend.

SQUARE.

SQUARE, a. *skwār* [OF. *esquarré*; It. *squadro*, square—from L. *ex*, out; *quadrārē*, to square; *quadrus*, four-cornered—from *quatuor*, four]: having four equal sides and four right angles; forming a right angle; having a straight front; not curved or round; fitting; that does equal justice; suitable; even: not leaving a balance; stout; well set; right or honest, as on the *square*, *square-dealing*; in *OE.*, parallel; exactly suitable: N. figure having four equal sides and four right angles (see PARALLELOGRAM): space of ground having four straight sides, with houses fronting inward erected on at least three sides: product of a number multiplied by itself (see below): instr. for drawing straight lines and tracing right angles; a body of troops in the form of a square (see below): level; equality; regularity; rule; conformity: in *OE.*, quaternion; number four; an astrological situation of planets distant 90° from each other: V. to form with four equal sides and four right angles; to reduce to a given standard; to adjust or regulate; to balance; to make even; to multiply into itself, as a number; to suit; to fit with; to determine the exact contents of in square measure, as the area of a circle; to take up the attitude of a boxer; in *OE.*, to quarrel; to go to opposite sides. **SQUARING**, imp. **SQUARED**, pp. *skwārd*: **ADJ.** made in the form of a square; adjusted; regulated. **SQUARE'LY**, ad. *-lī*. **SQUARE'NESS**, n. *-nēs*, the state of being square. **SQUAR'ISH**, a. *-īsh*, nearly square. **SQUARE MEASURE**, measure having length and breadth. **SQUARE NUMBER**, product resulting from any number multiplied into itself; the second power of a number. **SQUARE-PIERCED**, in *her.*, term applied to a charge perforated with a square opening, to show the field. **SQUARE ROOT**, that part of a number which, when multiplied into itself, produces the number (see **SQUARE** and **SQUARE ROOT**). **SQUARE-RIGGED**, a. having the principal sails of a vessel extended by yards instead of stays. **SQUARE-SAIL**, four-sided sail extended to a yard. **SQUARE-TOED**, having the toes square; precise; punctilious. **SQUARE-TOES**, an old-fashioned formal person. **ALL SQUARE**, all settled; all right. **ON THE SQUARE**, in an open fair manner; honestly. **HOLLOW SQUARE**, body of soldiers drawn up in the form of a square, with a space in the centre for the officers, staff, etc. (see **SQUARE**, in **Military Evolutions**). **OUT OF SQUARE**, does not correspond with facts; crooked in the reasoning. **TO SQUARE THE CIRCLE**, to undertake an impossibility (see **QUADRATURE OF THE CIRCLE**). *Note.*—In such expressions as *four square yards* and *four yards square*, the *former* signifies an area or space containing 4 spaces, each a yard long and a yard broad; the *latter* signifies four yards long multiplied by four yards broad, producing 16 *spaces*, each a yard long and a yard broad. When the expressions are restricted to *unity* or *one*, the results are the same—thus, *one square yard* is identical in result with *one yard square*.

SQUARE, in **Military Evolutions**: body of troops formed into a rectangular figure, with several ranks or rows of men facing on each side. With men of ordinary firmness, a square should resist the charges of the heaviest horse.

SQUARES.

The formation is not new, for a Grecian syntagma was a solid square of 16 men in every direction; but in modern warfare, the solid square having been found cumbrous, has been abandoned for the hollow square, with officers, horses, colors, etc., in the centre. The front rank kneels, and the next two stoop, which enables five ranks of men to maintain a rolling fire on any advancing enemy, or to pour in a murderous volley at close quarters.—When orders or proclamations are to be read to troops, the files of the hollow square face inward instead of outward.

SQUARES, METHOD OF LEAST: in astronomy, the best mode hitherto discovered of obtaining the most correct result from a number of observations on any phenomenon. These observations are assumed to differ slightly from each other, and to be all of equal value, i.e., taken under equally favorable conditions and with equal instruments. The ordinary and long-established mode of approximating to the truth in such cases is by finding the arithmetic mean, and accepting it as the correct result; but in all cases where the result required does not come directly from observation, but requires to be discovered by calculation, this simple and useful method is inapplicable, and that of 'Least Squares,' which gives more probable corrections, is adopted. The method is founded on a theorem propounded first by Legendre 1806, more for insuring uniformity among calculators than from belief in its intrinsic value; but it was afterward thoroughly discussed and proved by Gauss and Laplace, that 'if the mean of a number of distinct observations be so taken that the sum of the squares of its differences from the actual observations (generally designated *errors*) shall be a minimum, this mean will be, under these circumstances, the correctest obtainable value.' The process by which the mean thus obtained is shown to be the most trustworthy approximation is too long for insertion here; but an example is given of the most common form of the method as occurring in astronomy. Let there be a series of equations—

$$\begin{aligned} X &= x + y + 2z, \\ X_1 &= 3x + 2y + 5z, \\ X_2 &= 4x + y + 4z, \\ X_3 &= -x + 3y + 3z; \end{aligned}$$

where the unknown quantities are x , y , and z , connected by various (the more the better) equations with X , X_1 , etc., quantities which must be determined by actual observation. Suppose the values of the quantities thus found to be 3, 5, 21, and 14, then, since by hypothesis all these four observations are erroneous, the errors are $3 - X$, $5 - X_1$, $21 - X_2$, $14 - X_3$, or

$$\begin{aligned} 3 - x - y - 2z, \\ 5 - 3x - 2y - 5z, \\ 21 - 4x - y - 4z, \\ 14 + x - 3y - 3z. \end{aligned}$$

The squares of these four errors are now added together; and, to find the values of x , y , and z , which will render this sum (call it S) a minimum, we must differentiate S

SQUARE AND SQUARE ROOT.

with respect to x , y , and z in turn, and putting each of these partial differential coefficients equal to zero, we obtain the three equations, $-88 + 27x + 8y + 30z = 0$; $-76 + 8x + 15y + 25z = 0$, and $-157 + 30x + 25y + 54z = 0$; from which the most trustworthy values of x , y , and z , can be found by common algebra.—See a paper by Ellis in *Cambridge Transactions*, VIII.

SQUARE AND SQUARE ROOT: particular cases of *Involution and Evolution* (q.v.), in which the second power and root alone are involved. The process by which the sq. root of a number is obtained resembles division, differing only by the circumstance that the divisor is changed at each successive step. The rule adopted in arithmetic is deduced from algebra in the following manner: The sq. of $a + b$ is $a^2 + 2ab + b^2$, which may be written $a^2 + b(2a + b)$, and to find the sq. root of the latter, we have merely to subtract a portion (a^2), taking care that it be a sq. number, and forming a divisor with twice the sq. root of this portion ($2a$) increased by (b) the remainder of the root (which, in arithmetic, must be found by trial, as in division), and putting (b) the remainder of the root now found, in the quotient, proceed as in division. This mode of obtaining a divisor from the part of the root already obtained (a), and the part next to be obtained (b), and employing it, must be repeated till the whole sq. root is found. In the extraction of the sq. root in arithmetic, it is assumed that the squares of the nine digits are known; and also that the sq. of a number contains either twice, or one less than twice, as many digits as the number itself contains; the former being the case when the sq. number has an *even* number of digits, the latter when the number of digits is *odd*. By dividing, then, a number into periods of two figures each, we can at once see how many digits its root contains. To illustrate the method of operation adopted in arithmetic and algebra, let the sq. root of 128,881 be required; remembering that the sq. of $a + b + c$ is $a^2 + 2ab + b^2 + 2(a + b)c + c^2$:

$$\begin{array}{rcl}
 & 12,88,81 & (300 + 50 \text{ (or } 350) + 9 = 359 \\
 (a^2 =) 300^2 & = & \underline{90000} \quad a + b \text{ (or } a + b) + c \\
 & & 38881 \\
 (2ab + b^2 =) 2 \times 300 \times 50 + 50^2 & = & \underline{32500} \\
 & & 6381 \\
 (2(a + b)c + c^2) & & \underline{6381} \\
 2 \times 350 \times 9 + 9^2 & = & \underline{6381} \\
 \\
 a & = & 300 \quad 12,88,81 (300 = a \\
 & & \underline{300} \quad 90000 \quad 50 = b \\
 2a + b & = & \underline{650} \quad)38881 \quad 9 = c \\
 & & 50 \quad \underline{32500} \quad 359 \\
 2(a + b) + c & = & \underline{709} \quad)6381 \\
 & & \underline{6381}
 \end{array}$$

In the common arithmetical mode, the zeros are omitted, and we subtract from 12 the square nearest to it, not recognizing the portion of the root, 3, as more than a digit of units, till the next period, 88, has been brought down for the second step, when it is evident that the 3 is *at least* 3 tens, and consequently the 6 in the divisor represents 60; similarly, it is only at the commencement of the third step

SUARROSE—SQUASH.

that we find the 5 to represent 50, and the 3, 300. A comparison of the above examples will show the agreement and difference between the two modes.

SUARROSE, a. *skwōr'rōs*, or **SUAR'ROUS**, a. *-rūs* [mid. L. *squarrōsus*, covered with scurf or scab]: in *bot.*, covered with projecting parts or jags; having scales, small leaves, or projections spreading widely from the axis on which they are crowded. **SUAR'RULOSE**, a. *-ū-lōs*, slightly squarrose.

SQUASH, v. *skwōsh* [Low Ger. *quasken*, expressing the sound of dabbling in a wet material, or walking with water in the shoes: Ger. *quatschen*, to quash: OF. *esquacher*, to crush something soft]: to bear or press into pulp; to crush into a flat mass: N. anything soft and easily crushed; a sudden fall of a heavy soft body; a shock of soft bodies. **SQUASH'ING**, imp. **SQUASHED**, pp. *skwōsht*. **SQUASHY**, a. *skwōsh'ī*, like a squash; muddy. **SQUASH'INESS**, n. *-ī-nēs*, the state of being squashy or soft. **SQUISH-SQUASH**, the noise made by the feet in walking over swampy ground.

SQUASH, n. *skwōsh*: properly **MUSQUASH** (q.v.).

SQUASH, n. *skwōsh* [N. Amer. Indian, *asq*, raw, green, immature—plu. *asquash*], (*Cucurbita*, order *Cucurbitaceæ*): vegetable belonging to the gourd family (see **GOURD**), grown extensively in gardens and on truck farms, and in both temperate and tropical regions, though more largely in the United States than elsewhere. It yields best when grown in warm, rich, and moderately dry soils. Different varieties vary greatly in luxuriance of growth, the bush sorts growing nearly erect and the running kinds sending out vines 10 to 15 ft. in length. Planting should be in hills 4 ft. apart each way for the small sorts to 10 ft. for the larger sorts. A liberal quantity of rich compost should be put in each hill and worked into the soil. Planting must be delayed till the ground is dry and warm. Ten or more seeds are to be planted in each hill, but when they have obtained a vigorous start all but three or four plants should be removed. Frequent cultivation should be given. As soon as the leaves appear the plants must be protected from the striped beetle and the Squash-bug (q.v.), by the use of a frame for each hill covered with mosquito-netting, or by sprinkling the leaves with plaster or wood-ashes. The S.-borer often proves destructive of the running varieties: its effects are counteracted by covering with earth, soon after the vines have commenced to run, the first two or three joints of the plant. The summer sorts of the S. are used in the green state. Winter varieties, if well ripened, gathered before frost, and properly stored, can be kept till late in spring. Varieties differ greatly in color, form, size, and quality, but hybridize very readily with each other and with pumpkins, and can be kept pure only by planting them considerable distances apart. The S. was cultivated by Indians previous to the settlement of this country by white men: it is now very largely grown for the table, and to some extent for feeding to stock; and there are about 50 varieties under cultivation.

SQUASH-BUG—SQUEAMISH.

SQUASH'-BUG (*Anasa tristis*): hemipterous insect of family Coreidæ, which destroys squash and pumpkin vines by eating the leaves. Its color is black and its odor extremely offensive. Its eggs are laid in patches on the under side of the leaves. The first brood appears in the n. about July 1, and is soon followed by others. Prevention is secured by covering the plants with mosquito-netting, or by application of plaster or wood-ashes (see SQUASH). Mixing a tablespoonful of kerosene with two quarts of plaster or ashes is said to increase their efficiency. Arsenical poisons are sometimes used.—Another insect (*Diabrotica vittata*), known both as the striped squash-bug and the striped cucumber beetle, also feeds on the leaves and is very destructive: the same preventive measures as for the squash-bug should be used against it.

SQUAT, v. *skwŏt* [imitative of a drop of liquid falling to the ground, then used to signify lying close and flat like a liquid mass: prov. Dan. *squat*, a blot, a drop: prov. Eng. *squol*, to spot with dirt]: to sit or cower down on the hams or heels; to stoop or lie close to escape observation; to settle on new lands without a title; in *OE.*, to bruise or make flat by letting fall: **ADJ.** sitting on the hams or heels; sitting close to the ground; cowering; short and thick, like an animal cowering: **N.** in *OE.*, the posture of one who sits on his hams. **SQUAT'ING**, imp.: **ADJ.** used for sitting or squatting upon: **N.** the act of settling upon new lands without a title. **SQUAT'TED**, pp. **SQUAT'TER**, n. *-tér*, one who squats: in the *United States*, a settler who occupies lands, especially public lands, without just title: in the *Australian colonies*, a name applied to sheep-farmers and cattle-breeders who occupy extensive tracts of land from govt. at very low rental (see *NEW SOUTH WALES: VICTORIA*).

SQUAW, n. *skwaro* [Amer. Indian, *squa*, a woman]: a female; a wife.

SQUEAK, v. *skwĕk* [imitative of a short cry, as *squeal* of a prolonged sound: Ger. *quieken*, to squeak like a pig]: to utter a short shrill cry; to make a sharp disagreeable noise: **N.** a short acute cry. **SQUEAK'ING**, imp.: **ADJ.** crying with a sharp voice; making sharp disagreeable sounds. **SQUEAKED**, pp. *skwĕkt*. **SQUEAK'ER**, n. *-ér*, one who squeaks.

SQUEAL, v. *skwĕl* [Icel. *squala*, to scream, to cry: Dan. *squaller*, noisy talk (see *SQUALL* 1 and *SQUEAK*)]: to cry with a sharp, shrill, continuous sound: **N.** a sharp shrill sound less momentary than a squeak. **SQUEAL'ING**, imp.: **ADJ.** uttering sharp shrill sounds. **SQUEALED**, pp. *skwĕld*.

SQUEAMISH, a. *skwĕm'ish* [imitative of a certain degree of choking or oppression: Dan. *quæle*, to oppress: Sw. *qualja*, to make sick; *qualm*, oppressive weather: Norw. *sveim*, a sickness]: sickish at stomach; overnice; scrupulous; easily disgusted. **SQUEAM'ISHLY**, ad. *-lĭ*. **SQUEAM'ISHNESS**, n. *-nĕs*. the state of being squeamish; fastidiousness.—**SYN.** of 'squeamish': fastidious; nice; dainty.

SQUEEGEE—SQUIER.

SQUEEGEE, n. *skwē-jē'* [from *squeege*, vulgar corruption of *squeeze*]: a scrubber, consisting of a plate of gutta-percha at the end of a handle, used for cleaning the decks of ships, foot-pavements, etc.; written also **SQUILLAGEE** and **SQUILGEE**.

SQUEEZE, v. *skwēz* [AS. *cwysan*, to squeeze, to crush: Low Ger. *quetsen*; Ger. *quetschen*, to squeeze]: to press between two bodies; to embrace closely; to oppress by extortion; to crowd closely together; to press: N. the act of one who squeezes; pressure between bodies. **SQUEEZ'ING**, imp.: N. the act of compressing; oppression; in *plu.*, the produce of squeezing; dregs. **SQUEEZED**, pp. *skwēzd*. **SQUEEZ'ABLE**, a. *-ā-bl*, admitting of being squeezed. To **SQUEEZE OUT**, to force out by pressure. as a liquid. To **SQUEEZE THROUGH**, to pass through by pressing.—**SYN.** of 'squeeze, v.': to hug; press; pinch; gripe; crush; crowd; oppress; clasp; bruise; pound; compress.

SQUELCH, v. *skwēlsh* [imitative of the sound produced by the fall of soft bodies]: to crush: N. a flat heavy fall. **SQUELCH'ING**, imp. **SQUELCHED**, pp. *skwēlsht*.

SQUETEAGUE, n. *skwē-tēg'* [etym. doubt.], (*Otolithus regalis*): fish found in Long Island Sound and the Gulf of St. Lawrence. The flesh is wholesome and well-flavored, but as it soon grows soft does not rank high in market. The air-bladder makes excellent isinglass. It is a voracious fish and bites readily, but its mouth is easily torn, whence it is often called **WEAK-FISH**.

SQUIB, n. *skwīb* [Icel. *svipa*, to flash, to dart; *svipr*, a swift movement, twinkling]: a firework which, after ignition, bursts with a loud noise; a light witty composition reflecting on another, less sarcastic than a lampoon; in *OE.*, a petty fellow; one of the lower functionaries of the old gaming-houses: V. in *Amer.*, to utter sarcastic expressions. **SQUIB'ING**, imp. **SQUIBBED**, pp. *skwībd*.

SQUID, n. *skwīd* [a corruption of **SQUIRT**]: another name for the cuttle-fish—so called from its *squirting* out a brownish-black liquor: see **CALAMARY**.

SQUIER, *skwīr*, EPHRAIM GEORGE, LL.D.: 1821, June 17—1888, Apr. 17; b. Bethlehem, N. Y.: author and archeologist. In youth he was a school-teacher and engineer; 1840 was editor of *The Mechanic*, at Albany; 1843, of the Hartford (Conn.) *Journal*; and 1844, of the *Scioto* (Ohio) *Gazette*. His attention being attracted to the antiquities of the Scioto valley, he made exploration of similar monuments through the Mississippi valley; an account of which was published 1848, forming Vol. I. of *Smithsonian Contributions to Knowledge*. He made similar explorations in N. Y. and Conn.; and being appointed *chargé d'affaires* to Guatemala and other states of Central America 1849, he used his official position in making extensive geographical and archeological explorations. He was honored 1851 with the gold medal of the French Geog. Soc. Returning to Central America (1853), he surveyed a railway route through Honduras, and drew up the treaty between that country and England for the retrocession of the Bay

SQUILL—SQUILLA.

Islands. While in Peru as U. S. commissioner (1863-65) he made exhaustive researches concerning the remains of the Incas.—Among his works are: *Nicaragua: its People, Scenery, Ancient Monuments, and Proposed Inter-oceanic Canal* (1852); *The Serpent Symbol, or Worship of the Reciprocal Principles of Nature in America* (1852); *Notes on Central America* (1854); *Waikna, or Adventures on the Mosquito Shore* (1855); *Question Anglo-Americaine* (1856); *The States of Central America* (1857); Report of the Honduras Survey (1859); a work on Tropical Fibres (1861); *Honduras* (1870); *Peru* (1876); articles in *Encyc. Brit.*; etc.

SQUILL, n. *skwĭl* [F. *squille*; Sp. *esquila*; L. *scilla*; Gr. *skilla*, the sea-onion]: lily-like bulbous-rooted plant used in medicine; nearly allied to Hyacinths, Onions, etc., and having a spreading perianth, stamens shorter than the perianth, smooth filaments, a 3-parted ovary, and a 3-cornered capsule with three many-seeded cells. Gardeners apply the name S. also to various species of *Scilla*. The **OFFICINAL S.** (*Scilla maritima*), native of the sandy shores of the Mediterranean, has a scape two to four ft. high, with raceme of many whitish flowers, and large leaves. The bulb is of the size of a man's fist, sometimes of a child's head, and contains a viscid juice so acrid as to blister the fingers if much handled; while the vapor arising from it irritates the nose and eyes. Squill was used in medicine by the ancients. Its use is contra-indicated if inflammatory symptoms are present. Its dose as diuretic is one to three grains of the powdered bulb, or about 20 minims of the tincture. As expectorant, the dose of the powdered squill should not exceed one grain, repeated several times daily.

Various species of S. are planted for ornament. *S. bifolia* has rich blue flowers early in the season. The Spanish S. has large flowers of light blue; the Italian is pale blue with bright blue stamens; the Peruvian has white stamens; and the Siberian is of porcelain blue. An American species, *S. Fraseri*, is called Wild S. or Wild Hyacinth; it is found from O. w. and s.w. and has pale blue flowers.

SQUILLA, *skwĭlla*: genus of crustaceans, of order *Stomapoda*, type of a family, *Squillidae*, to which the names *Mantis Crab*, *Mantis Shrimp*, and *Sea-mantis* are popularly given, from the strong general resemblance to insects of genus *Mantis* (q.v.). The form is elongated; the carapace covers only the anterior part of the thorax, the latter part of which is formed of rings like the abdomen; the eyes are on stalks; the claws are very large, and furnished with spines, forming powerful instruments of prehension; the tail is expanded into a broad fin. The species are numerous, and mostly inhabit tropical seas. A species



Squilla Man-
tis.

about seven inches long, *S. mantis*, is found in the Mediterranean. The *Squillæ* are extremely active, and very bold and voracious.

SQUINCH—SQUINTING.

SQUINCH, *skwīnch*: small arches or corbelled courses across the angles of square towers, to bring in the form to carry an octagonal spire, lantern, etc.: see PENDENTIVE.

SQUINT, v. *skwīnt* [F. *guigner*, to wink or aim with one eye: Dut. *schuīnte*, a slope]: to look or see obliquely; to have the eyes differently directed: N. a defect of vision (see SQUINTING): in *arch.*, oblique narrow opening, generally about 2 ft. wide, in the inner walls of many old churches, designed to afford a view of the high altar to those at the sides in the aisles: ADJ. looking obliquely; not having the eyes both turned in the same direction. **SQUINT'ING**, imp.: N. the act or habit of looking obliquely. **SQUINT'ED**, pp. **SQUINT'INGLY**, ad. -ly. **SQUINT-EYED**, a. having eyes that squint; indirect; malignant. **SQUINY**, v. *skwīn'i*, in *OE.*, to look asquint. **SQUIN'YING**, imp. **SQUINIED**, pp. *skwīn'id*.

SQUINTING, or **STRABIS'MUS**, defect of vision, which may be defined as a lack of parallelism in the visual axes, when the patient endeavors to direct both eyes to an object at the same time. The squint is said to be *convergent* when the eye or eyes are directed toward the nose, and *divergent* when they are directed toward the temple; and is termed *single* or *double* according as one eye or both are displaced. The divergent form is comparatively rare, except in consequence of prolonged loss of sight of one eye. The causes are various. Intestinal irritation, such as the presence of worms, will often induce it slightly in children. In other cases it may be traced to the temporary cerebral irritation produced by teething; and it is a very common symptom in hydrocephalus and other serious head-affections. Among other causes are a lack of equal normal visual power in both eyes, in extreme short-sight; but from extensive observation with the ophthalmoscope, Dixon, surgeon to the Royal Ophthalmic Hospital, Moorfields, England, has come to the conclusion that, 'in the great majority of instances of confirmed squint existing in children, the optic nerves themselves are ill-developed, being usually smaller than natural, of a more or less oval form, and of a dusky color.' If the squint is only temporary, and possibly arises from intestinal irritation, the bowels must be well cleared out, and tonics subsequently given. If due to some peculiarity in the visual focus of the eyes, it may be removed by judicious use of glasses. In every case ophthalmoscopic examination is the first duty of the surgeon; and he should also take all means to ascertain that no organic disease exists in the brain or orbital nerves; and that there is no tumor in the orbit, mechanically burdening the movements of the eye. The surgical operation for cure consists in the division of the muscle which, by permanently drawing the eye inward or outward, and overpowering its antagonistic muscle, induces the deformity. It is better to dispense with the use of chloroform in this operation, if the patient have sufficient nerve to avoid flinching; as in that case the doubt that sometimes arises as to whether the muscle has been sufficiently divided can be at once solved by directing the patient to attempt inversion of the eye.

SQUIRE—SQUIRREL.

SQUIRE, n. *skwîr* [abbreviated form of **ESQUIRE**, which see]: popular abbreviation of *Esquire* (q.v.), usually applied in England to a landed gentleman by his tenantry and others: an attendant on a noble warrior: in *OE.*, an attendant at court. In some rural parts of the United States, *S.* is a familiar prefix to names of magistrates, and often of lawyers, etc. **SQUIREARCH**, n. *skwîr'âr-k*, a member of the squirearchy. **SQUIRE'ARCHY**, n. *-âr-kî* [Gr. *archê*, sovereignty, rule]: in England, term applied to country gentlemen collectively. **SQUIRE'LING**, n. *skwîr'ling*, a small or young squire, in contempt.

SQUIRM, v. *skwêrm* [perhaps connected with **WORM**]: to writhe or wriggle, like a worm.

SQUIRREL, n. *skwér'rêl* [OF. *escurel*—from L. *sciûrus*; Gr. *skiou'ros*, a squirrel, a shadow-tail—from Gr. *skiâ*, shade; *oura*, a tail: F. *écureuil*, a squirrel], (*Sciurus*): Linnaean genus of rodent quadrupeds, now the family *Sciuridae*. They belong to the section of Rodentia having perfect clavicles, and are further characterized by a long bushy tail; the fore-paws furnished with four toes, which have curved claws, and a tubercular thumb; the hind-legs long, their feet with five toes; two incisors in each jaw; four molar teeth on each side in each jaw, simple, with tuberculous crowns, and a fifth in the front of the upper jaw, which soon falls out. Most of the species commonly carry the tail curved over the body, whence the Greek name *Skiouros*, of which the Eng. *squirrel* is a corruption. The species are numerous, and are found in almost all parts of the world, except Australia; some inhabiting temperate and even cold regions, while some belong to tropical countries. Squirrels are very active and agile creatures, at once shy and pert, very adroit in hiding themselves on the appearance of danger, but resembling monkeys in inquisitive curiosity. They inhabit woods, and spend their lives mostly in trees, which they climb with wonderful agility, running along the branches, and leaping from tree to tree. Their running is a kind of bounding, and the tail is then stretched out, as it is also in their leaps from branch to branch, often to great distances. The true squirrels resemble the Flying S. (q.v.) in spreading out their limbs and tail to the utmost in leaping, particularly when they descend from a high branch to the ground; and they thus leap from a great height without injury. Some species, however, seldom ascend trees, but burrow in the ground, and are further distinguished by having cheek-pouches, while the tail is shorter than in the tree-squirrels; and its hair not so distinctly arranged in two lateral rows. These *Ground-squirrels* form the genus *Tamias*. All the squirrels feed on fruits and seeds, the young shoots of trees, and such vegetable substances; though they sometimes vary their diet by plundering birds' nests, and not only sucking eggs, but devouring young birds: they are fond also of the larvæ of insects. In eating, they often sit erect, and hold the food in their fore-paws. The hardest nut presents no difficulty to their sharp strong teeth. Many of the species, probably

SQUIRREL.

all those of temperate and cold climates, lay up stores for winter.—The COMMON S. (*S. vulgaris*) of Europe is a beautiful little animal, brownish red on upper parts, white beneath; the color changes more or less in winter to a grayish brown, and in n. countries to gray. It is widely distributed over northern parts of the old world. The winter hoards of the S. are usually in holes in the ground about the roots of trees—the same pair of squirrels having often a number of these hoards. The seeds of firs form a large part of the winter-food of squirrels.—Another European species is the ALPINE S. (*S. alpinus*), native of the Alps and Pyrenees, about the same size with the Common S., deep brown, speckled with yellowish white.—N. America is rich in species and varieties of S. J. A. Allen (*Rodentia*, U. S. Geol. Survey, 1877) describes 16 species and 13 varieties of *Sciurus* and *Tamias*, besides 11 species and 7 varieties of *Spermophilus*, and two of *Sciuropterus*—total 49. Of *Sciurus* there are the Chickaree, or Red or Pine S. (*S. hudsonius*), e. of the Rocky Mts.; the upper side of the tail with hairs rusty at base. The three varieties, their English names Latinized in the scientific, agree with it in having a narrow black lateral line, and all are found in the Rocky Mts., the second in Wash. also; they are: Fremont's, tail-hairs gray at base; Richardson's, the same dark reddish brown; and Douglass' or Oregon Red S., body fulvous beneath. *S. Carolinensis* is the Southern Gray S., rarely black, and, when gray, the back brownish; and its variety *leucotis*, the Northern Gray S., Canada to La., larger, with more restricted brownish area; it is, or was, often wholly black, but this melanic variety has offered too good a mark for boys' guns, and is in many places exterminated. The Yucatan Gray S. is the smallest, and plain gray. Abert's S., of Colo. to Arizona, has a dorsal band of bright chestnut. The Fox S., with absurd regard to priority, is named *S. niger* (one of its varieties having been so named 1743) instead of *vulpinus* (1788), which latter well designates the foxy color more or less present in all its varieties. These are the Southern Fox S. (var. *niger*), color variable, often dusky, but nose and ears white; the Northern Fox S. (var. *cinereus*), Me. to Va., similar, without the white; and the Western Fox S. (var. *ludovicianus*), with much rufous color. The California Gray S. (*S. fessor*), Or. to Lower Cal., has the tail black, washed with white. Mexican species are the Varied S. (*S. boothia*), deep brownish red beneath; the Golden-bellied (*S. leucops*), golden-yellow, varying to white, beneath; the Red-bellied (*S. aureogaster*), reddish orange below; the Orizaba S. (*S. tephrogaster*), olivaceous brown above; Collie's S., clear gray above; the Fire-bellied S. (*S. hypopyrrhus*), narrow-tailed and coarse-haired; of these the third extends to Guatemala, and the fourth to S. America. Gerard's S., dark reddish to fiery orange beneath, is a Central and S. Amer. species; and *S. variabilis*, above black varied with yellow, is S. American. Of the genus *Tamias* are the common Chipmunk or Striped S. (*T. striatus*), Canada and U. S. to Dak. and La., the back with two

SQUIRT—S'RÂDDHA.

white and five black stripes; Harris' Chipmunk, New Mex. to Cal., lacking the black stripes; the large *S. Lateralis*, Black Hills to Sierra Nevada and Cascade ranges, the two white stripes each bordered with black; and *T. asiaticus*, with four white and five black stripes, some of its forms occurring in n. Asia and e. Europe, and five varieties in N. Amer.—viz.: the Northern Chipmunk (var. *borealis*), from n. e. Europe through n. Asia to near the U. S., and having the sides fulvous; the Rocky Mt. Chipmunk (var. *quadrivittatus*), middle and s. Rocky Mts., the sides bright, rusty or golden; the Pale Chipmunk (var. *pallidus*), dry western plains and Great Basin; the Gila Chipmunk (var. *dorsalis*), more southerly, pale, and stripes obsolete; and Townsend's Chipmunk, n. Cal. to Brit. Columbia, large, with strongly marked dark stripes. Of the genus *Spermophilus*. *S. grammurus*, Colo. to Mex., is finely mottled above, and the tail below has three lengthwise bands of black: it has a s. Cal. variety, and one in n. Cal. and w. Or., both known as Ground-squirrel. *S. empetra* is comparatively large, with squarish white spots above; it has Kodiak Island and Brit. Columbia varieties. *S. Richardsoni*, N. Dak. and northern plains, is smaller, with mixed colors, and has a Dak. to Wash. variety. *S. mollis*, n. Utah and w., has no ear projection. *S. spilosoma*, Tex. and n. Mex., has spots, but not in rows. *S. obsoletus*, Black Hills and Great Basin, is similar, but yellowish brown, not reddish, above. *S. tereticaudus* of s. Cal. is described in its name. *S. Mexicanus* has white spots in 9-11 rows. The Leopard S. of the prairies (*S. tridecemlineatus*) has 6-8 light lines alternating with 5-7 rows of light spots, and there is a var. *pallidus* on the dry plains; the gray-headed S. (*S. Franklini*), Mo. to lat. 64°, is the large gray ground-squirrel of the prairies; and the Annulated-tailed S. of w. Mex. is described in its name. Of the species *Sciuropterus volucella*, there are two varieties, the Northern Flying S., and the Southern, the latter smaller, tail less dusky, and the body more yellowish above.—For the so-called Barking Squirrel, see PRAIRIE DOG.

The fur of some American squirrels is an article of commerce: it is one of the cheap furs.

SQUIRT, v. *skwért* [Norw. *squitra* to spout, to splash: Sw. *squätta*, to squirt]: to eject from a narrow pipe or orifice, as water; to throw out in a stream with sudden jerks: N. a small instr. by which a liquid may be thrown out in sudden streams; a syringe. SQUIRT'ING, imp. SQUIRT'ED, pp. SQUIRTING CUCUMBER, a plant, the fruit of which, when nearly ripe, separates suddenly from its stalk, and at the same time ejects its juice and seeds; the *Momordica elatérium*, or *Ecbalium agrestē*, ord. *Cucurbitacæ*.

SQUITCH: see COUCH GRASS.

S'RÂDDHA, *srád'há* [Skr. *s'raddhá*, faith, belief]: name of the funeral ceremony of the Hindus, in which balls of food, and water, are offered to the deceased ancestors of the sacrificer, or to the *Pitr'is* or manes collectively. S. is supposed necessary to secure the ascent and

S'RÂVAKA—STABAT MATER.

residence of the souls of the deceased in a world appropriated to the manes. But it is observed also on occasions of rejoicing; hence various S'râddhas are enumerated—*constant, occasional, voluntary*, etc. The presentation of the ball of food to the deceased, and to his progenitors in both lines, is the office of the nearest male relative, *and is the test and title of his claim to the inheritance*.—See H. H. Wilson's *Glossary of Judicial and Revenue Terms* (Lond. 1855).

S'RÂVAKA, *srâ'va-ka* [from Skr. *s'ru*, to hear]: name of the disciples of Buddha, who, through the 'hearing' of his doctrine, and by practicing the four great Buddhistic truths, attain the qualification of an Arhat, or Buddhist saint. From among the number of the disciples of Buddha, 80 are called the *Mahâs'râvakas*, or the great S'râvikas.

S'RUTI [from Skr. *s'ru*, hear; hence, literally, the hearing, or that which is heard]: in Sanskrit literature, technical term for all those works considered to have been revealed by a deity. See VEDA.

SS, *ës'ëz*, COLLAR OF: collar composed of a series of the letter S in gold, either linked together or set in close order, on a blue and white ribbon, with the ends connected by two buckles and a trefoil shaped link, from which hangs a jewel. Such collars have been much worn in England by persons holding great offices in the state, as well as by the gentry of various ranks, from esquires upward. They are of frequent occurrence on sculptured monuments. The origin of the device has evoked many theories, but none satisfactory. The collar had, without doubt, originally a Lancastrian character. Collars of SS are still worn by certain high officials.

ST. (preceding a name): abbreviation for SAINT: see in alphabetical place for SAINT.

STAB, v. *stăb* [Gael. *stob*, to thrust, to drive into the ground; *stob*, a pointed iron: Icel. *stappa*, to pound, to stamp: L. *stipārē*, to stuff, to cram: Gr. *steibō*, I stamp, I tread]: to give a sharp abrupt thrust with a pointed weapon; to give a mortal wound; hence, to injure secretly by malicious falsehoods: N. the thrust of a pointed weapon; an injury done secretly. STAB'ING, imp.: N. act of one who stabs. STABBED, pp. *stăbd*. STAB'BER, n. *-bër*, one who or that which stabs. To STAB AT, to thrust a pointed weapon at.

STABAT MATER, *stă'băt măt'tër* [L. *mater*, the mother; *stabat*, was standing]: *the* (weeping) *mother was standing*; first words of a celebrated Latin hymn (used to designate the hymn) on the Crucifixion—composed, as is believed, by Jacopone, a Franciscan, in the 13th c., whose theme is the Virgin Mary at the Cross. The S. M. begins

Stabat mater dolorosa
Juxta crucem lacrimosa
Dum pendebat filius.

The S. M. forms part of the service of the Rom. Cath.

STABILITY AND INSTABILITY.

Church during Holy Week (q.v.: see also PASSION WEEK). It has been set to music by many composers of eminence. Pergolese's *Stabat Mater*, written by that eminent musician on his deathbed, is justly celebrated for its pathos and expression. Rossini's more secular *Stabat Mater* also is well known to all lovers of music.

STABILITY AND INSTABILITY: terms denoting different conditions of equilibrium. When a body rests upon a surface, in such a manner that a vertical from its centre of gravity falls within the largest polygon which can be formed by joining the various points of contact of base and surface, it will stand; but if the contrary is the case, it will fall, unless extraneously supported. If the base of the body be a plane, and the supporting surface convex, or *vice versâ*, or if both base and surface be convex, there will be only one point of support, and if the body be at rest, its centre of gravity must be vertically over the point of contact. Should a body so placed receive a slight impulse, it will either oscillate to and fro, ultimately returning to its original position; or will remove further and further from its original position, showing a tendency not to return; or will appear indifferent to any one position. In the first case, the body is said to be in *stable*, in the second case, in *unstable*, and in the third, in *neutral equilibrium* (see STATICS). Fig. 1 shows various

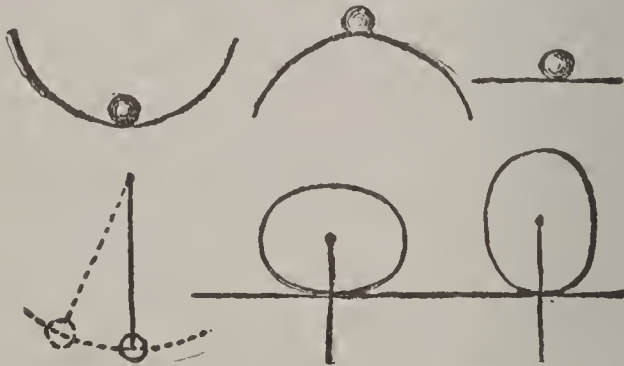


Fig. 1.

illustrations of these three species. It will appear at once that the predetermining cause of equilibrium, being of one rather than of another of these species, is the tendency of the centre of gravity of every body to seek a lower position; and the illustrations show that in stable equilibrium the centre of gravity of the body may, and in unstable equilibrium may not, attain a lower position, while in neutral equilibrium its position continues unaltered. In illustration of the mode in which the species of equilibrium possessed by a body which has received a slight impulse is determined, let us take the case of a body with a spherical base resting upon a spherical surface (Fig. 2); let S and O be the centres of the spherical surfaces respectively, and let A be their point of contact (the centre of gravity being consequently in the line SA, or in it produced toward S, and after displacement, in the line S'A', produced if necessary), let the new position of S, after the body has been slightly displaced, be S', and the new point

STABLE.

of contact B; join OS, OS', S'A', and draw BD vertically, that is, parallel to OC. Then $A'D : A'S' :: OB : OS'$, or $A'D = \frac{A'S' \times OB}{OS'}$, that is, $A'D$ = the product of the radii of the two surfaces divided by their sum. Now, should the centre of gravity of the displaced body fall between D and A', it will have a moment round B tending to restore the body to its former position (*stable equilibrium*); should the centre of gravity be beyond D from A', its moment round B will tend to increase the displacement (*unstable equilibrium*); while, if it fall in the line BD, it will still be above the point of contact, as it was at first, and there will be no tendency either to return to, or to

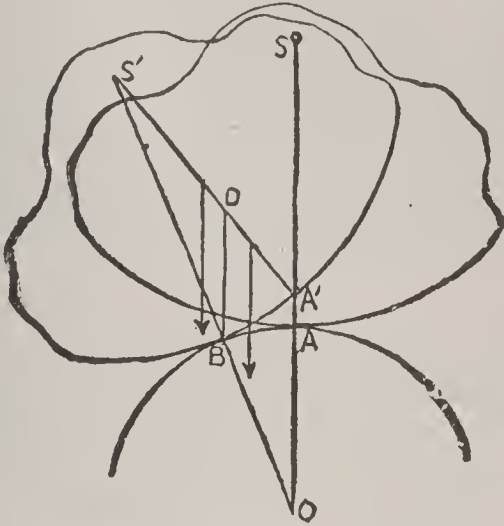


Fig. 2.

move further from, the original position (*neutral equilibrium*). These conditions may be briefly expressed by the following formulæ, in which R is the radius of the supporting surface, r of the spherical base of the body, and X the distance of the centre of gravity from the point A; when equilibrium is stable, X is less than $\frac{R \times r}{R + r}$; when unstable, X is greater than $\frac{R \times r}{R + r}$; and

when neutral, $X = \frac{R \times r}{R + r}$ From these formulæ, the con-

ditions of equilibrium of a body, with a spherical base on a plane surface, can be at once deduced by making $R = \infty$, the three species of equilibrium being then represented in order by X less than r , X greater than r , and $X = r$; the simplest illustrations of these being respectively a segment of a sphere, a tall cone on a spherical base, and a sphere.

STABLE, a. *stā'bl* [F. *stable*, stable—from L. *stabilis*, that stands fast or firm—from *sto*, I stand; It. *stabile*]: firmly established; fixed in resolution or conduct; durable; not fickle. **STA'BLY**, ad. *-bli*. **STA'BLENESS**, n. *-bl-nēs*, or **STABILITY**, n. *stā-bīl'ī-tī* [F. *stabilité*]: strength to stand without being moved; firmness; immovability; strength of resolution or purpose; steadiness; constancy. **STABLE**

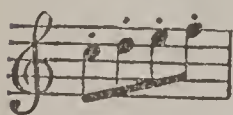
STABLE—STACHYS.

EQUILIBRIUM, the property of a body of returning to its original position when disturbed (see **STABILITY AND INSTABILITY: STATICS**).—**SYN.** of 'stable': strong; durable; fixed; established; steady; constant; immovable; firm; abiding.

STABLE, n. *stā'bl* [OF. *estable*, a stable—from L. *stabilum*, a standing-place, a stable—from *sto*, I stand]: a stand or house for horses: V. to put into or keep in a stable; to dwell in a stable. **STA'BLING**, imp. *-bling*: N. accommodation or houses for the shelter of horses. **STABLED**, pp. *stā'bl'd*. **STA'BLEMAN**, n. one who attends to stables and the horses in them. **STA'BLER**, n. *-blēr*, one who stables horses. **STABLE-BOY**, a boy who waits on horses in a stable.

STABLISH, v. *stāb'lish* [for **ESTABLISH**, which see]: in *OE.*, to establish; to fix; to settle.

STACCATO, ad. *stāk-kā'tō* [It. detached]: in music, a term implying a detached, abrupt mode of performance. A certain amount of time is subtracted from the proper value of any note played S., and a rest substituted. A dot placed over a note indicates that it is to be played S:

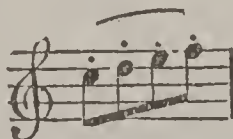


A dash implies a greater degree of S.:



and a very slight degree of S. is expressed by uniting the

dot with the slur:



; the slur being the sign

of a *legato* expression, the converse of staccato.

STACHYS, *stāk'kīs*: genus of plants of nat. order *Labiata* (*Lamiaceæ* of Lindley), containing a great number of species (about 160 known), mostly European, having a ten-ribbed calyx, with five nearly equal teeth, the upper lip of the corolla entire, and the lower lip three-lobed. *S. sylvatica* is very common in shady places, a coarse herbaceous plant, sometimes called *Hedge-nettle*, with stem 2–3 ft. high. *S. palustris* is another common species, growing in moist places, and sometimes a very troublesome weed in meadows: it was formerly used as a vulnerary, and has therefore the English name *Woundwort*. Several species are frequent in flower-gardens.—*S. palustris* is common in the U. S., of many varieties, rough or smooth. Another species is *S. hyssopifolia*, 1 ft. high, growing in wet sandy soil, with linear leaves. Cultivated for ornament are *S. lanata* from Europe, with low, tufted, mullein-like leaves, and purple flowers, and the Scarlet S. (*S. coccinea*) from Mexico.

An important Japanese species is *S. tuberifera*, a tuberiferous plant, with many properties resembling those of

STACK—STADE.

the potato: it is a native of Japan. The mode of cultivation is that of the potato. The tubers found in a single hill are often more than 100, though they are smaller than average potato tubers. Chemical analysis of the tubers gives the following results:

| | | |
|---------------------------------|-------|-----------|
| Water..... | 78·33 | per cent. |
| Protein..... | 1·50 | “ |
| Amide..... | 1·67 | “ |
| Fat..... | 0·18 | “ |
| Carbon hydrate (galactine)..... | 16·57 | “ |
| Cellulose..... | 0·73 | “ |
| Ash..... | 1·02 | “ |

There is neither starch nor sugar, but the substance *galactine*, intermediate between them. The tubers have agreeable taste when boiled in salt water and served with butter and parsley sauce. Sliced and fried in butter they are said to be delicious: the taste at first seems like that of the sweet potato, but one soon detects a fine piquant flavor. They do not need to be peeled. They are kept in the ground as late as possible, and when dug are packed in sand till required for use. Exposed to air they shrink and lose their mother-of-pearl-like color. They are not injured by frost.

STACK, n. *stāk* [Icel. *stakka*, a stump; *stakkr*, a stack or projecting heap: Sw. *stack*; Dan. *stak*, a stack]: a large conical heap of corn in the straw, thatched on the top; a large pile of hay, straw, or wood; a number of chimneys standing together; in *geol.*, a pillar-like rock standing separate from a line of cliffs: V. to lay up in a large pile or heap. **STACK'ING**, imp. **STACKED**, pp. *stākt*. **STACK-YARD**, the space of ground where grain in the straw is piled in large heaps or stacks. **STACK OF ARMS**, firearms placed together so as to form a conical heap, with their ends resting on the ground.

STACTE, n. *stāk'tě* [Gr. *staktē*, myrrh-oil]: a fatty and very odoriferous liquid, being a kind of myrrh.

STADDLE, n. *stād'dl*, or **STADLE**, n. *stād'l* [AS. *stæthel*, a foundation: Icel. *stada*, standing: Dan. *stade*, station, a standing]: in *OE.*, a support; the support or platform of a stack; a young tree left standing when the underwood is cut down: V. to leave staddles when a wood is cut down. **STAD'DLING**, imp. *-dlīng*. **STADDLED**, pp. *stād'dld*. **STADDLE-ROOF**, the roof or covering of a stack.

STADE, *stā'déh*: small and very ancient town, formerly fortified, in Prussian Hanover, near the mouth of the Schwinge, a tributary of the Elbe. Pop. (1880) 9,700.

The *Stade Dues* were a toll or duty formerly charged by the Hanoverian govt. on all merchandise carried up the Elbe to Hamburg. The original duties, regulated by treaty 1691, were comparatively light, but were gradually increased till they brought to Hanover a revenue of about \$200,000. After several modifications 1844 and 54, this vexatious toll was finally abolished 1861, Hanover receiving a compensation equivalent to about \$150,000 annually; of which Great Britain paid one-third, another third was

STADHOLDER—STADTHOLDER.

contributed by Hamburg, and the remaining third divided proportionally among the other countries that traded to the Elbe.

STADHOLDER, *stăd'höld-ér* [Dutch *stadhouder*, stead-holder or *locum tenens*—from *stad*, place; *houder*, holder]: literally, stead-holder, lieutenant, representative. — In usage, S. designates a lieut.gov., especially of the Netherlands (for the king of Spain); afterward, governor, head of the state, chief magistrate (of the United Provinces). In the 16th c., when the tyranny of Ferdinand, Duke of Alva, gov. under Philip II., drove the principal towns of the Netherlands into revolt, they chose William, Prince of Orange, for their gov.; and to make it plain that the revolt was not against Philip, but against Alva, they conferred on William no higher title than that of Stadhouder. On the assassination of William 1584, the provinces of Holland, Zeeland, and Utrecht, agreeing to have one stadhouder, appointed Maurice of Nassau to that office, which came tacitly to be regarded hereditary. The stadhouderate thus instituted was considered to be at an end or in abeyance on the extinction of the line of William I., by the death of William III. However, on the triumph of the Orange party over the republican 1747, William IV., descended from a collateral branch of the House of Nassau, was proclaimed stadhouder, capt.gen., and admiral-in-chief of the Seven United Provinces, those dignities being made hereditary in his family. His son, William V., seventh stadhouder, was driven from his country by the French 1795, and resigned his office 1802; since which time, the stadhouderate has never been revived, the Netherlands having, at the Congress of Vienna, been formed into a kingdom.

STADIUM, n. *stă'di-ŭm* [L. *stadium*; Gr. *stadiŏn*]: ancient measure of length, consisting of 125 anc. paces or 625 Roman ft., equal to 606 ft. 9 inches English; the eighth part of a Roman mile.—The stadium originally was the space of ground set apart for foot-races and all other gymnastic contests except horse-racing, which were wont to be celebrated at Olympia and other places in Greece; the horse and chariot races being held in the *Hippodrome* (q.v.). The S. was of the same form as the hippodrome, and the arrangement of the spectators was similar. The distance between the starting-point and the goal was, in the Olympic stadium, about 600 Greek ft.; and the stadia of other places adopted the dimensions of that at Olympia. This distance of 600 Greek ft. was adopted as the chief Greek measure of length, and called a *stadium*.—S. is used to denote also the stage of a disease.

STADTHOLDER, n. *stăt'höld-ér*: perverted form of STADHOLDER (q.v.).

STAËL-HOLSTEIN.

STAËL-HOLSTEIN, *stâ-ël'ül-stäng'*, ANNE LOUISE GERMAINE NECKER, Baronne DE: 1766, Apr. 22—1817, July 14; b. Paris; daughter of the celebrated Necker (q.v.), finance minister of Louis XVI. in the times immediately preceding the Revolution. Her mother was a woman of severe character, and from her earliest years subjected her to rigorous discipline. The daughter, in consequence, had no very warm attachment for her; but for her father, who was indulgent, she had ardent affection, regarding him then and always with excessive fondness and admiration. Her talents were precociously developed, and while yet a child, she would listen with eager and intelligent interest to the conversation of the Parisian *savants* who used to frequent her father's house. In 1786 she was married to the Baron de Staël-Holstein, Swedish minister at Paris, an elderly gentleman, with whom her happiness was probably not great; inasmuch as after a few years an amicable separation took place—two sons and a daughter having been the fruit of their union. In 1788 she issued her first work, *Lettres sur les Écrits et le Caractère de J. J. Rousseau*, which are rather a girl's passionate eulogy of an idol than a just and discriminating criticism.

Her sympathy with the Revolution in its earlier stage of promise was enthusiastic, but gave place, as its later enormities were developed, to a reaction of horror vividly set forth in her subsequent *Considérations sur la Révolution Française*. Her grief was extreme on the failure of the attempt by the royal family to escape; and she engaged in a secret scheme for securing them a flight to England. This came to nothing; and she then, with her father, betook herself to Switzerland, his native country. The news of the king's execution inexpressibly shocked her; and she sought to save the life of the queen by publishing *Réflexions sur le Procès de la Reine, par Une Femme*, which, however, was too late to be effective. In 1795 she published at Lausanne, under the title *Recueil de Morceaux Détachés*, a collection of her juvenile writings; and the next year a treatise *De l'Influence des Passions sur le Bonheur des Individus et des Nations*, a work unmistakable in its indications of rare talent. In 1797, order having been re-established under the directory, she was again in Paris. From the first, she distrusted Napoleon, and suspected him of evil designs; and her *salon* became the headquarters of the anti-Bonapartist faction. In vain she was offered restitution of two million livres since 1788 due to her father from the royal treasury; she declined the bribe; and as neither fear nor favor could lead her to disguise her hostility to Napoleon, it seemed well for him to rid himself of her. She was forbidden to live in Paris, and subsequently (1802) exiled from France itself. Meanwhile, she had greatly increased her reputation by the publication of her romance of *Delphine*, and a work *Sur la Littérature considérée dans ses Rapports avec l'État Moral et Politique des Nations*. She now, for two years, travelled in Italy and in Germany, making at Weimar the acquaintance of Goethe, Schiller, Herder, Wieland, etc. The death of her father 1804 re-

STAEL-HOLSTEIN.

called her to Coppet, in Switzerland. Subsequently, she was permitted to return to Paris; and there, 1807, she published her famous *Corinne, ou l'Italie*, whose success was instant and immense, and won for her a European reputation. As a bitter in the sweet of fame, however, fresh difficulties with Napoleon occurred; and the unrestrained spitefulness of her antagonism caused her to be banished anew to Coppet. Her son, the Baron Auguste, then 17 years old, sought to intercede for his mother in a personal interview granted him by the emperor, whose inexorable deliverance on the occasion was characteristic and amusing: 'Avec l'exaltation de sa tête, la manie qu'elle a d'écrire *sur tout et à propos de rien*, elle pouvait se faire des prosélytes; j'ai dû y veiller.' And it must be conceded, despite the shrieks about Napoleon's 'ungenerous persecution,' that he acted on a sound prudential policy. A woman who would keep no terms with him, who was uncompromising and fearless, and whose genius and reputation gave her influence, was clearly in Paris, of all places, not to be tolerated by the head of a government such as his, more or less the sport of the hour, and always in its basis precarious. After this, when disgusted with Coppet, where she found herself subjected to a petty *surveillance*, Madame de S. rushed restlessly over Europe to Vienna, Moscow, St. Petersburg, thence through Finland to Stockholm, and afterward to London, where, 1813, she published her great book, *De l'Allemagne*, previously suppressed in Paris. As the first decisive revelation of the genius of Germany to the French people—somewhat as the earlier writings of Thomas Carlyle revealed it to the reading public of Britain—this may perhaps rank as the most important and influential of her works. Of her various experiences of travel, an interesting record is preserved in her *Dix Années d'Exil*. At the restoration, she returned to her beloved Paris; from Louis XVIII. she had a most gracious reception; and restitution was granted her of the two millions on her father's account above mentioned. Soon afterward her health failed; she sought its restoration in a visit to Italy 1816, but without effect; and the next year she died at Paris. She was buried at Coppet; and by her will the fact was revealed that, in 1812, she had privately married M. de Rocca, a French officer of Hussars, aged 25—something of an *escapade* for a mature matron of 46. In this wedlock she gave birth to a son. M. de Rocca survived her only a few months. On the whole, she had scarcely been happy, as cursed with the 'desires infinite and hopes impossible' which make life little better than a sad unfulfilled longing to one of her peculiar temperament and genius. Her touching wail of *Jamais, jamais, je ne serai jamais aimé comme j'aime* was a cry out of her inmost heart. In this light, there may seem some element of pathos in this marriage, otherwise not without an element of the ridiculous.

Madame de S. has been ranked in the first class of female genius. During the second quarter of the 19th c. her *Corinne* had immense vogue in Europe and America

among the literary classes. It is now little read except as a curiosity. The type of sentimentalism to which it appealed no longer sways the public mind. Madame de S. was indeed a woman of remarkable intellectual force, but it scarcely seems a creative force: rather its work seems to have been that of receptiveness and interpretation; and this is wrought in the forms of a rich and impassioned rhetoric. She has curtly, and perhaps not with entire aptness, been defined as a sort of Rousseau in petticoats.

Her son published an ed. of her works in 18 vols. 1821, with a biographical notice by Madame Necker de Saussure.—See Norris, *Life and Times of Madame de S.* (1853); and Dr. Stevens, *Madame de S.: a Study of her Life and Times* (2 vols. 1880).

STAFF, n. *stáf*, plu. **STAFFS**, *stáfs*, or **STAVES**, *stāvz* [Icel. *stafr*; Dut *staf*; Dan. *stab*, *stav*; Ger. *stab*, a staff; Gael. *stob*, a stake: L. *stipēs*, a stake or stock]: stick or club carried in the hand for support or defense; pole; long handle: badge of authority or office: that which upholds; prop: in *music*, the five parallel lines, and the four spaces between them, on which the notes and other musical characters are indicated—also **STAVE** (see **GAMUT: MUSIC: SOLFEGGIO: ETC.**): in *OE.*, a stanza. **STAFF**, plu. **STAFFS**, a body of officers attached to an army, or to its commander, whose duty is to assist the commander in carrying his plans into execution, and in maintaining the army in a state of efficiency (see **STAFF, MILITARY OR NAVAL**): a number of persons engaged to act together in any undertaking or work, as a *staff* of clerks, a *staff* of reporters. **STAFF**, plu. **STAVES**, step or round of a ladder. **STAFF-ANGLE**, in *arch.*, a square rod of wood or other material standing flush with the finished plastering of the wall on each side at the external angles of the plastering. **JACOB'S-STAFF**, a rod or pointed staff shod with iron for fixing in the ground, having a socket at the top for a compass, used in surveying. **CROSS-STAFF**, a staff with sights at right angles, used in surveying. **FLAG-STAFF**, a lofty pole on which a flag can be hoisted.

STAFF, n. *stōf* [prob. a variant of *stuff*]: composition for building purposes, statuary, etc.; composed chiefly of plaster of Paris, mixed with a little cement, glycerin, and dextrin in water. It was largely used at the Columbian Exposition, 1893.

STAFF, MILITARY OR NAVAL: body of skilled officers, whose duty it is to combine and give vitality to the movements and mechanical action of the several regiments and drilled bodies—or of the several ships, squadrons, etc.—composing the force. The distinction between an officer on the S. of an army and a regimental officer is that the latter is concerned with his own regt. alone, while the former deals with his army, or section of an army exceeding a regt., and regulates the combined action of the several arms and bodies of men. A good S. is all-important to the success of a military enterprise.

The General S. of an army is a corps of officers charged with the duty of assisting the commander-in-chief in arranging details of marches, operations, and battles, in issuing commands for the movement of troops, in directing

reconnaissances, in conducting the correspondence of the commander with the national war department and the several corps d'armée in the field. In some govts. the General S. in time of peace is divided into sections for systematically studying problems of offensive and defensive war, collecting information as to the military status of foreign countries, making tours of observation, devising plans for rapid mobilization, transportation, and concentration, noting new inventions in arms and war material. In France, Russia, and England are institutes for training officers for the General S. The General S. of an army in the field consists of a chief of S., adjt.gen., commissary-gen., quartermaster-gen., chief of artillery, chief engineer, and the like.—In the United States the General S. consists of the 'maj.gen. commanding the army' (see GENERAL OFFICER), Adjt.gen. (q.v.), Inspector-gen. (q.v.), Judge-advocate-gen. (q.v.), quartermaster-gen. (see QUARTER: QUARTERMASTER'S DEPARTMENT), commissary-gen. of subsistence, surgeon-gen., Paymaster-gen. (q.v.), chief of engineers (see ENGINEERS, U. S. CORPS OF), chief of ordnance (see ORDNANCE DEPARTMENT).—In the U. S. navy the term S. is used to designate only the non-combatant officers attached to the navy, as the medical corps (see MEDICAL DEPARTMENT), pay corps (see PAYMASTER-GENERAL OF THE NAVY), steam-engineers' corps (see ENGINEERS IN THE U. S. NAVY), professors of mathematics in the naval school, naval constructors, and the like; but the officers of the several bureaus of the navy dept. (e.g., see ORDNANCE, BUREAU OF) in effect constitute a naval S. comparable to the army S.: these bureaus are those of Ordnance (q.v.), equipment and recruiting, navigation, yards and docks, provisions and clothing, steam-engineering, medicine and surgery (see MEDICAL DEPARTMENT), construction and repair, judge-advocate-gen., inspection and survey, naval intelligence.—The 'Personal S.' consists of the aides-de-camp and military secretaries of general officers in army or navy.—See in general, titles of various milit. and naval officers: also GENERAL OFFICER: EQUIPMENT: MANNING THE NAVY: REGIMENT: UNITED STATES ARMY: UNITED STATES NAVY. ; ———

STAFFA, *stáffa*: celebrated island, w. of Scotland, about 7 m. off the w. coast of Mull. It forms an uneven table-land, rising at its highest 144 ft. above sea-level; $1\frac{1}{2}$ m. in circumference, oval in shape. In the n.e., in the lee of the prevailing winds, is a tract of low shore stretching out in beaches and forming a landing-place. The other parts of the coast are girt with cliffs 84 to 112 ft. high. Regarded in section, the rocks show themselves of three kinds—conglomerated tufa, forming the basement; columnar basalt, arranged in colonnades which form the façades and the walls of the chief caves; and amorphous basalt, overlying the columnar basalt, but pierced here and there by ends of columns and by angular blocks. The most remarkable feature of the island is Fingal's Cave, or the Great Cave, whose entrance is formed by columnar ranges on each side, supporting a lofty arch. The en-

trance is 33 ft. wide, 60 ft. high; length of the cave 212 ft. The floor of this marvellous chamber is the sea, which throws up flashing and many-colored lights against the pendent columns whitened with calcareous stalagmite, which form the roof, and against the pillared walls of the cave.

STAFF COLLEGE, in the British Army: government institution founded 1858, about 2 m. from Sandhurst, for higher instruction of 40 officers aspiring to appointments on the staff; thus taking the place, though more effectively, of the old senior class at the Royal Milit.^y College.

STAFF CORPS, *kōrz*, in the British Army: bodies of intelligent officers and men who aid the general and staff officers by performing camp duties, reconnaissances, and other necessary labors unsuitable for regimental officers or soldiers. Such a corps served during Wellington's campaigns, and then was disbanded. Similar corps have since been occasionally organized for various departments; but all except the Army Hospital Corps were merged 1870 into the Army Service Corps.—S. C. is also the name given to the English officers serving on the permanent Indian establishment.

STAFFORD, *stäffērd*: inland county of England, between the counties of Cheshire and Warwick; 748,433 acres, or about 1,170 sq. m. The most elevated portion is the north, where wild moorlands in long ridges, separated by deep valleys, extend n.w. to s.e., subsiding as they near the valley of the Trent. The surface is low or undulating in the midland regions, hilly in the south. New red sandstone occupies the whole central part; the Pottery coal-field occupies the n., and the Dudley coal-field, remarkable also for its abundant and rich iron ores, occupies the s. The Trent, flowing first s.w. through the county, then n.e. along its e. border, is the chief river. The climate is cold and humid; and though three-fourths of the area are arable, much of the soil is cold and clayey, and agriculture is in a backward condition. At the Potteries around Stoke (q.v.), Burslem, and Hanley there is extensive manufacture of china and earthenware: see POTTERY: WEDGWOOD. In the s. there is extensive iron manufacture in all branches, from mining to production of articles in iron and steel. Numerous canals (including the Grand Trunk canal) and railways traverse the county.—Pop. (1871) 858,326; (1881) 981,012; (1901) 879,625.

STAFFORD: county town of Staffordshire, England; on the Sow, 123 m. from London, about 29 m. n.n.w. from Birmingham. There are two very fine old parish churches—the oldest, St. Chad; the finest, St. Mary's. Pop. (1881) 19,977; (1891) 20,270.

STAFFORD: town, Tolland co., Conn., on Willimantic river and New London Northern r.r., 25 m. n.e. of Hartford. It contains the villages of Stafford or Stafford Furnace (woolen factory); Stafford Springs (cotton and woolen mills); Staffordville (iron-foundry, machine-shop, and woolen mills); and West Stafford (manufactories of centring-machines, mowing-machines, etc.). Pop. (1900) 4,297.

STAFFORD, HENRY, Duke of Buckingham: 1440-1483, Nov. 1; b. England. When 20 years of age he received his title, but for some time did not become prominent. He was one of the leaders in the plot of the Duke of Gloucester, then Protector and afterward Richard III., to seize the throne 1483; assisted in the overthrow of Earl Rivers and Lord Gray, and was rewarded by appointment as chief-justice and constable of the royal castles in Wales. In June of the same year he made an address at Guildhall in which he forcibly presented the claims of Richard as sovereign. In less than a month from that time he was appointed constable of England, but soon deserted the king, joined the Lancastrians in their conspiracy, was promptly betrayed by supposed friends, was tried and condemned, and was beheaded at Salisbury. He is one of the characters in Shakespeare's tragedy *King Richard III.*, in the acting version of which (greatly changed from the original) is the line (taking the place of 7 lines) from the king:

'Off with his head! so much for Buckingham.'

STAG, n. *stäg* [a name applied to the male of various animals: Icel. *steggr*, a he-bird, drake, tom-cat: Scot. *staig*, a stallion or young horse]: the male deer; fem. *hind* (see below): a reindeer in his fifth year: in *stock exchange slang*, an unlicensed or unrecognized dealer in shares; one without means who applies for an allocation of shares in a joint-stock concern with a view to selling them at a profit. STAG'GARD, n. *-gérð*, a stag four years old. STAG-BEETLE (see below). STAG-EVIL, kind of palsy in the jaws of horses. STAG-WORM, a worm troublesome to deer.

STAG, or RED DEER (*Cervus elaphus*): species of Deer (q.v.) with round antlers, which have a snag at the base in front. The female (*Hind*) has no horns. The young male, during the first year, acquires mere knobs in place of horns. In the second year, the knobs are longer and pointed, and the animal is called a *Brocket*. The branching of the horns increases every year till the sixth, when the name Hart (q.v.) begins to be applied. After this the age is no longer indicated by an increased number of branches, but the antlers become larger and thicker, their furrows deeper, and the *burr* at the base more projecting. The oldest stags have seldom more than 10 or 12 branches, though an instance has occurred of 33 on each antler. A fine S. is four ft. or more in height at the shoulder. The color is reddish brown in summer, the rump pale; in winter it is brownish gray. The female is smaller than the male. The young is at first spotted with white. The S. is a native of Europe and n. Asia. It was anciently common in all parts of Britain, but is now almost extinct, except in the Highlands of Scotland, where large herds still exist, particularly on the Grampians, and the sport of deer-stalking is pursued, in which the rifle is now generally used; though formerly the S. was hunted with hounds of peculiar breed, called Staghounds (q.v.). The forest laws of England were extremely strict for preservation of this noble game—the unauthorized killing of a S. being even a more unpardonable offense than the killing of a man. The S. feeds on

STAG BEETLE—STAGE

the buds and young shoots of trees, and on grass; or, in severe winter weather, on bark and mosses. Its speed is very great: it has also great powers of swimming, and has been known to swim 10 miles. When hard pressed by hunters, it turns to bay, and is not approached without danger. At the pairing season, in Aug., even the tame stags become so excited that it is not safe to approach them. The domestication of the S. is never quite complete. In fighting, the S. uses not only its horns, but its fore-feet, with which it gives severe blows to an adversary. The flesh is not so good as that of the Fallow Deer.—Among the species of deer most nearly allied to the S. are the Wapiti (q.v.), an Amer. species, and several species belonging to the warmer parts of Asia and n. Africa. They all have round branched antlers, with a basal snag in front, and a tuft of hair on the hind legs.

STAG BEETLE (*Lucanus*): genus of coleopterous insects, of family *Lamellicornes*, remarkable for the large projecting mandibles of the males, which have large denticulations, and somewhat resemble stag's horns. The antennæ terminate in a club of many leaflets disposed on an axis like the teeth of a comb. The COMMON S. B. (*L. cervus*) is one of the largest of British insects, the males being fully two inches long. It flies about in the evening in the middle of summer, chiefly frequenting oak-woods. The larva feeds on the wood of the oak and the willow, and is injurious to the trunks of trees, into which it eats its way very rapidly. It is supposed to be the *Cossus* of the ancient Romans, esteemed by them as a delicacy of food. It lives several years before undergoing its transformations. In its perfect state, the S. B. is a formidable-looking insect, and its powerful mandibles are capable of inflicting a severe bite, if it is incautiously seized; but it is not venomous. Some of the tropical stag-beetles are remarkable for brilliancy of color.—A species of S. B. found in the United States is *Lucanus elaphus*.

STAGE, n. *stāj* [OF. *estage*, a story, height of a house—from L. *sto*, I stand: It. *staggio*, a prop]: elevated platform for an exhibition, etc.; a floor; a story; a landing quay or pier: the theatre or theatrical representations—also, the actual part where the performance takes place (see THEATRE): any place where a thing is publicly done or transacted; place of time or action, as the *stage* of life; a resting-place on a journey; a stage-coach; the distance travelled over without resting; degree of progress or advance, as the *stages* of a disease: V. in *OE.* to exhibit publicly. **STAGER**, n. *stāj'ēr*, a person practiced in cunning; a horse that runs in a stage-coach. **STA'GING**, n. *-jīng*, a temporary structure of boards and posts for support. **STAGEY**, a. *stāj'i*, *familiarly*, characterized by a theatrical and bombastic style or manner, as a *stagey* manner. **STAGE-BOX**, a box close to the stage in a theatre. **STAGE-COACH**, a coach running between two places with certain points of rest. **STAGE-PLAY**, a theatrical entertainment. **STAGE PLAYER**, an actor on the stage. **AN OLD STAGER**, an old practitioner; one who has long lived in the same place or belonged to the same society.

STAGER—STAGHOUND.

STAGER, *stā'jēr*, Anson: 1825, Apr. 20—1885, Mar. 26; b. Ontario, N. Y.: telegrapher. In 1841 he entered the printing establishment of Henry O'Reilly; and when, soon afterward, his employer engaged in building and operating telegraph lines, S. went with him, and 1846 was placed in charge of the first office (at Lancaster) on the line between Philadelphia and Harrisburg. In 1852 he was made gen. supt. of the lines centring in Cincinnati, and retained the office after the Western Union Co. acquired the lines. At the beginning of the civil war he was placed in charge of the lines in O. and along the Va. border; and soon afterward was appointed gen. supt. of all the govt. telegraph lines. He resigned from the service 1868, Sep., with the rank of brev. brig.gen. In 1869 he settled in Chicago; again became gen. supt., and was connected with many electrical and manufacturing concerns till his death.

STAGGER, v. *stäg'gēr* [prov. Dan. *staggre*, to stagger: Icel. *stakra*, to totter; *staka*, to push: O.Dut. *staggeren*, to stagger as a drunken man]: to totter; to reel; to walk with a series of abrupt movements while swaying from side to side; to cause to totter; to begin to give way; to cause to hesitate; to shock; to alarm: N. a sudden swing of the body as if the person were about to fall. **STAG'GERING**, imp.: **ADJ.** reeling; unsteady: N. the swinging unsteady motion of the body as if about to fall. **STAG'GERED**, pp. *-gērd*. **STAG'GERINGLY**, ad. *-gēr-īng-lī*. **STAG'GERS**, n. *-gērz*, disease in horses and cattle, attended with reeling or giddiness (see below): in *OE.*, wild conduct; irregular behavior.—**SYN.** of 'stagger, v.': to reel; totter; faint; hesitate; shock; alarm.

STAGGERS, *stäg'gērz*: popular term applied to several diseases of horses. Mad or Sleepy S. is inflammation of the brain, a rare but usually fatal complaint, marked by high fever, staggering gait, violent convulsive struggling usually terminating in stupor: it is treated by bleeding, full doses of physic, and cold applied to the head. Grass or Stomach S. is acute indigestion, usually from overloading the stomach and bowels with tough hard grass, vetches, or clover, a full meal of wheat, or other indigestible food. It is most frequent in summer and autumn, is indicated by impaired appetite, distended abdomen, dull aspect, unsteady gait; and is remedied by full doses of purgative medicine, such as six drachms of aloes and a drachm of calomel rubbed down together, and given in a quart of thin well-boiled gruel. Frequent clysters, with hand rubbing and hot water to the belly, likewise are useful. Where the dulness increases, stimulants should be freely given: see **HYDATIDS**. For the S. in sheep, see **STURDY**.

STAG'HOUND: large and powerful kind of Hound (q.v.), formerly much used in England for hunting the stag; now almost extinct. It is supposed to be a breed of the old English Southern Hound. In scent, it is almost equal to the bloodhound; in fleetness, it is inferior to the foxhound. It has great endurance, and has been known to run 50 m. after the stag. It is also courageous, and does not hesitate to attack the stag at bay.

STAGING: see under STAGE.

STAGIRA, *stā-jī'rā*, or STAGI'ROS, -rös: ancient town of Thrace, noted as the birthplace of Aristotle, who is hence called 'The Stagirite.' Its modern name is Stavros. S. was founded B.C. 656 by a colony from the island of Andros. It stood on the peninsula of Chalcidice in the Strimonian Gulf (Gulf of Orfano). When Thrace was conquered by the Macedonians, S. was destroyed, but it was restored by Philip II. at Aristotle's request.

STAGIRITE, n., improperly STAGYRITE, n. *stāj'ī-rīt*: name often applied to Aristotle, the great philosopher, from the place of his birth, Stagira (q.v.).

STAGNATE, v. *stāj nāt* [L. *stagnātus*, pp. of *stagnāre*, to be still—from *stagnum*, a piece of standing water—from *sto*, I stand: It. *stagno*, standing water: comp. Gael. *stang*, a pond]: to be or become motionless; to stand still; to cease to flow; to grow or be dull, as business. STAG'NATING, imp. STAG'NATED, pp. STAG'NANT, a. -*nānt* [F.—L.]: not flowing; motionless; still; inactive; dull. STAG'NANTLY, ad. -*lī*. STAG'NANCY, n. -*nān-sī*, or STAGNATION, n. *stāj-nā'shūn* [F.—L.]: the state of being without motion; the cessation of action; state of being dull.

STAHEL, *stā'el*, JULIUS: milit. officer: b. Csongrad, Hungary, 1825, Nov. 4. At the outbreak of the Hungarian revolution he had become a 1st lieut. in the Austrian army; but he joined the revolutionists and served till their defeat, when he went to Germany, then to England, and finally settled in New York, and engaged in journalism. In 1861, May, he was appointed lieut.col. 8th N. Y. vols.; was promoted col. for bravery at the first battle of Bull Run, brig.gen. 1861, Nov. 12, and maj.gen. 1863, Mar. 14; and resigned 1865, Feb. 8. He was U. S. consul at Yokohama 1866–69, engaged in mining 1870–77, again consul at Yokohama 1877–84, and consul-gen. at Shanghai from 1884, Mar., till his resignation the following year.

STAHL, *stāl*, GEORG ERNST: German chemist and physician: 1660, Oct. 21—1734, May 14; b. Anspach. He studied medicine at Jena, and after practicing successfully was called 1694 to the chair of medicine, anatomy, and chemistry, in the newly founded Univ. of Halle; whence he removed to Berlin 1716, where he was appointed physician to the king of Prussia. He was a member of the Berlin Acad.; and in that city he died—According to Blumenbach, S. was one of the greatest and most profound physicians that the world has ever seen; but the mysticism with which his works are imbued is to be reprehended. S.'s system of medicine, a combination of the physiology of Van Helmont (q.v.) with the psychology of Descartes (q.v.), is founded on the theory of the existence of a mysterious force residing in, but independent of and superior to, matter; this force, the *anima* (or 'soul'), not only forms the body, but directs it in the exercise of all its functions, and this, too, sometimes unconsciously; though the way in which this influence is exercised S. does not explain. Being by nature subject to error, the 'anima,' by negli-

gence or maladroitness action, originates diseases in the body, which it then attempts to cure, through the functional action of the various parts. S. held that art ought to begin only where nature had ended, and, to be useful, should follow a similar course of action: he was of opinion also that plethora, local or general, was a chief cause of disease. His system of therapeutics corresponded with his pathological principles, and was confined mostly to bleeding and use of mild laxatives. His psychological theory of the connection between the soul and body (known as Stahlism or Stahlianism, one of the forms of Animism—q.v.) led him into a discussion with Leibnitz (who had falsely charged him with propounding materialism), from which he emerged victorious on the essential points of their respective theories; though Leibnitz (q.v.) had the advantage in matters of detail. (See SOUL: SPIRIT: ETC.) Subsequent physiologists ridiculed S.'s opinions; yet his doctrine of the 'anima' is, under the name of 'vital principle' and 'nature,' now generally adopted—though usually conceded to be a somewhat vague hypothesis; but his supercilious contempt for chemistry as a medical agent was discreditable, and has long ceased to find scientific advocacy. Nevertheless, S. was one of the ablest chemists of his time: he destroyed, in his usual trenchant style, numberless absurd opinions which had found their way into the science, and propounded the first theory of combustion (see PHLOGISTON), which was universally accepted till the time of Lavoisier (q.v.). His works, according to Haller, number 250; but the chief are: *Theoria Medica Vera* (Halle 1707, 08, 37), containing his medical theory; and *Zymotechnia Fundamentalis, seu Fermentationis Theoria Generalis* (Halle 1697), presenting his chemical opinions. For his opinions, see Haller's *Bibliotheca Medicinæ Practicæ*, III.; Sprengel's *Histoire de la Médecine*; A. Lemoine's *Le Vitalisme et l'Animisme de Stahl* (Paris 1864).

STAID, a. *stād* [a corruption of *stayed*, the pp. of *stay* (see STAY 2)]: not vacillating; grave; sober; not wild or flighty. STAID'LY, ad. *-lī*. STAID'NESS, n. *-nēs*, steadiness; regularity; gravity.—SYN. of 'staid': sober; steady; grave; regular; composed; sedate; constant; firm; stable.

STAIGG, *stīg*, RICHARD MORRELL: 1817, Sep. 7—1881, Oct. 11; b. Leeds, Eng.: artist. He began studying architecture and portrait-painting in Leeds; came to the United States 1831; and, settling in Newport, R. I., 1835, resumed the study of portrait-painting under the encouragement of Washington Allston and Jane Stuart. For many years he made a specialty of miniature-painting, subsequently painted life-size in oil, and in the latter part of his life applied himself to landscapes and genre studies. He was elected an associate of the National Acad. of Design 1856, and an academician 1861; and visited Europe 1867-69 and 1872-74.



Stag, Hind, and Calf (*cervus elaphus*).



Staghound.

STAIN—STAIR.

STAIN, v. *stān* [OF. *desteindre*, to deaden or take away the color of—from L. *dis*, away; *tingērē*, to dye]: to discolor; to tinge of a different color; to blot; to render foul; to tarnish; to bring reproach; to mark with guilt or infamy; to impress or mark with a variety of colors: N. a blot; a foul spot; a spot of different color from the ground on which it is: liquid coloring-matter designed to be absorbed by wood, ivory, or other material; often used to give cheaper wood the appearance of more costly kinds—these stains are chiefly metallic salts combined with vegetable infusions; often used also to give new work an appearance of age: taint of guilt; infamy; disgrace. **STAINING**, imp.: N. the process of making stains or tints, as on glass or paper. **STAINED**, pp. *stānd*. **STAIN'ER**, n. *-ēr*, one who stains. **STAIN'LESS**, a. *-lēś*, free from imperfections or blots; pure; faultless; free from guilt or sin. **STAINED GLASS**, glass variously colored, the colors being fused into it (see **GLASS**). **PAPER-STAINER**: see under **PAPER**.—**SYN.** of 'stain, v.': to color; paint; blot; dye; discolor; taint; disgrace; soil; sully; spot; pollute; blemish; tarnish; shame.

STAINER, *stān'ēr*, Sir JOHN, MUS.DOC.: born England, 1840. He graduated at Oxford, in both arts and music, became organist at Magdalen College when only 19 years of age, and was organist at St. Paul's Cathedral, London, 1872-88. He was knighted 1888, and the following year became prof. of music in Oxford Univ. Dr. S. is a brilliant instrumentalist, and a thoroughly scientific musician. He has composed numerous songs, anthems, and cantatas, and published various elementary works on music, a *Treatise on Harmony*, which passed through several editions, and *The Music of the Bible*.

STAIR, n. *stār* [AS. *stager*, a ladder, steps—from *stigan*, to step up: Dut. *steiger*, a mason's scaffold: Icel. *stigr*, a footway: Ger. *steg*, a path: Sw. *steg*, a step: Gael. *stair*, stepping-stones over a river]: a step. **STAIRS**, plu. *stārz*, series of steps upward or downward. **STAIRCASE**, inclosed series of steps from one level in a building to another. This feature, now so important in houses, was of small note till about the middle of the 16th c. Previously, all stairs were constructed on a circular plan, winding round a central axis or newel, and were called turret or corkscrew stairs. During the 16th and 17th c., staircases with wide straight flights were introduced, and were made leading features in mansions of the Elizabethan style: they had usually massive oak balusters with carved pedestals, and were ornamented with carved panels, pendants, etc. Staircases of this kind are still in common use, but mostly have been lighter in style, light cast-iron railings being sometimes substituted for the heavy oak balustrades. In recent years there is a return toward the massive and elaborate wooden construction. **BELOW-STAIRS** in the basement or lower part of a house. **UP-STAIRS**, in the higher rooms: the bedrooms. **FLIGHT OF STAIRS**, series of steps to the top of a tenement, or from one story to another; a staircase. **ONE PAIR, TWO PAIR OF STAIRS**, the first and second floors.

STAIR—STALACTITES AND STALAGMITES.

STAIR, EARLS OF: see DALRYMPLE.

STAITH, n. *stāth* [Icel. *stöð*; Dan. *stade*, a landing place, a station: Ger. *gestade*, a shore: Norw. *stöð*, a quay]. a landing-place for merchandise; a place where coals are shipped; a line of rails forming the extremity of a railway, laid on a stage or platform.

STAKE, n. *stāk* [allied to STACK and STICK: Dan. *stage*; Sw. *stake*; OF. *estac*, a stake, a tie: Ger. *stake*; O. Dut. *staech*, a stake, a stake for which one plays]: post or slab of wood sharpened at one end and firmly set in the ground, to which anything may be fastened; a piece of rough wood forming one of the uprights of a fence: martyrdom, because martyrs were bound to stakes when burned; anything placed in the hands of another, particularly money, to wait the result of a wager; state of being hazarded or pledged: small anvil: V. to support with stakes; to mark the limits off by stakes; to wager; to pledge; to hazard. STAKING, imp. supporting or marking out with stakes; putting to hazard upon a contingency. STAKED, pp. *stākt*. STAKE-HEAD, in *rope-making*, slab or post with wooden pins to keep the strands apart. STAKEHOLDER, one who holds the stakes or money intrusted to him by parties to a wager till the result be determined. STAKE-NET, net secured and outstretched by means of stakes (see SALMON). AT STAKE, in danger; hazarded; pledged. AT THE STAKE, at the post and fagots to suffer martyrdom by burning.

STAKED PLAIN, *stākplān* (Sp. LLANO ESTACADO, *lá'nō ěs-tá-ká'dō*): elevated plateau in n.w. Tex. and e. N. Mex., named from the stake-like boles of the yucca plant growing on it; 44,000 sq. m.; elevation from 1,000 ft. in the s. to 5,000 in the north. It is not well watered and has few trees, but the enormous roots of its shrubs furnish some fuel. In 1852 Lieut. Pope, by sinking artesian wells, attempted to provide a water-supply for a railroad across it to the Pacific, but with no great success.

STALACTITES, n. plu. *stāl-āk'tīts* [Gr. *stalaktos*, trickling or dropping—from *stalas'sō*, I fall or distil in drops]: icicle like incrustations of carbonate of lime, chalcedony, etc., which often cover the roofs of caverns and fissures, formed from the dropping water holding these substances in solution (see STALACTITES AND STALAGMITES). STALACTIC, a. *-tīk*, or STALACTICAL, a. *-tī-kāl*, or STALACTITIC, a. *stāl āk-tīt'īk*, pertaining to or resembling a stalactite. STALACTIFORM, a. *-tī-fawrm* [L. *forma*, a shape]: resembling or shaped like a stalactite.

STALACTITES AND STALAGMITES: mineral formations in caves and other places where water charged with carbonate of lime is subject to evaporation. Water impregnated with carbonic acid is able to dissolve lime; and as all rain and surface water contains more or less carbonic acid, it takes up in its passage through the earth to the roofs of caves a certain amount of lime. When this water is exposed on the roof or floor of the cave, evaporation takes place; thus both the bulk of the water and its

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solvent power (depending on the free carbonic acid, which escapes) are reduced, and a thin pellicle of solid carbonate of lime is deposited. When this takes place on the roof of the cave, long icicle-like pendants are formed, called stalactites; and when the water drops upon the floor, a stalagmitic layer is formed, which rises at the points where the largest supply of material exists, in the form of pillars (stalagmites), to meet the overhanging stalactites. In some caves, the descending and ascending points have met, and formed a series of natural columns as if supporting the roof. The color of the limestone thus formed is affected by the superincumbent strata, but is generally white or yellowish. The stalactites have a rich subcrystalline structure, being composed of acicular radiating crystals, arranged in concentric layers from their exogenous growth: sometimes, from metamorphic changes subsequent to their formation, they become more truly crystalline. The amount of deposition is very great in some caves, and the wonderful variety and singular groupings of the stalactites give them a peculiar beauty. The caves most remarkable in this way are the Mammoth Cave, Ky.; Wyandotte Cave, Ind.; Luray Cave, Va.; the Cave of Adelsberg in Styria; the Grotto of Antiparos in the Grecian Archipelago; and the caves of the Peak in Derbyshire, England.—The remains of primeval man found in the caves in France, and the fossils from the bone caves in Britain and elsewhere, are generally cemented together into a stalagmitic deposit on the floor of the cave.—See CAVES.

STALAGMITE, n. *stäl-äg'mīt* [Gr. *stalag'ma*, a drop—from *stalas'sō*, I fall or distil in drops]: the same mineral matter as *stalactites*, but applied to the incrustations that cover the floor of the cavern; the stalactites and stalagmites frequently meet together, and form pillar-like masses. **STALAGMITIC**, a. *stäl'äg-mīt'ik*, or **STALAGMITICAL**, a. *-ī-kāl*, having the texture or structure of stalagmite—applied to limestones which have an open, porous, and somewhat concretionary structure: see **STALACTITES** AND **STALAGMITES**.

STALE, a. *stāl* [O. Dut. *stel*, old]: having lost its freshness; old; long kept; vapid or tasteless from age; worn out by age or use; common; trite; no longer pleasing, as a story: V. in *OE.*, to wear out; to make old: N. in *OE.*, that which is stale; a prostitute. **STALELY**, ad. *-lī*. **STALENESS**, n. *-nēs*, the state of being stale; vapidness. **STALE DEMAND**, a claim which has not been pressed or claimed for a very long time.

STALE, v. *stāl* [Dut. *stallen*; OF. *estaler*; It. *stallare*, to pass urine when stopping on the road for that purpose—*lit.*, to come to a stand, from the root of *stall*: comp. Gael. *steall*, a gush, an outpour]: to urinate or pass water, as horses or cattle: N. in *OE.*, urine. **STALING**, imp. **STALED**, pp. *stāld*.

STALE, n. *stāl* [Dut. *stelle*, position, place: Ger. *stellen*, to place, to post]: in *OE.*, a bait laid to entrap; a decoy; a snare. **STALEMATE**, or **STALE**, a fixed state; a term in chess indicating a condition in which the game cannot proceed, the king having no move but into check.

STALE, n. *stāl* [Dut. *steel*; Ger. *stiel*, a stalk, a pillar]: in *OE.*, a stalk; a handle; a prop; a pillar.

STALIM'NE: see **LEMNOS**.

STALK, v. *stawk* [imitative of the sound of setting down the foot: AS. *stælcān*, to step: Dan. *stalke*, to go with high and long steps: Norw. *stauka*, to stump along like an old man with a stick: Gael. *stalc*, to dash the foot against, to stiffen]: to stride; to walk with high and affected steps; to creep along softly and warily; to walk behind something that covers: N. a proud stately step or walk. **STALK'ING**, imp.: **ADJ.** walking with stately steps. **STALKED**, pp. *stawkt*. **STALK'ER**, n. *-ēr*, one who stalks. **STALKING-HORSE**, a real or sham horse behind which the fowler or hunter warily approaches his game to snare or shoot it; any mask or pretense. **DEER-STALKING**, the act of approaching deer warily and stealthily.

STALK, n. *stawk* [Icel. *stilkur*, a stalk: Dan. *stilk*, a stem, a handle: comp. Gr. *stēl'ēchos*, a stem, a stump]: the stem or main prop of a plant; the stem or support which attaches a flower or fruit to a plant or tree; the stem or body of a quill; anything resembling a stalk, a very long chimney attached to a public work. **STALK'Y**, a. *-ī*, resembling a stalk; full of stalks. **STALK'LESS**, a. *-lēś*, destitute of a stalk.

STALL, n. *stawl* [Icel. *stallr*, that on which anything stands or is placed: AS. *steal*, a place, a stall: Ger. *stall*; It. *stallo*; OF. *estal*, a place, a seat]: place where a horse or an ox is kept and fed; division of a stable allotted to a single horse; small area partially inclosed, either in the open air or within a large building, where articles are exposed for sale; small workshop; reserved seat in a theatre: the raised seat of a dignitary of a cathedral or church, or a fixed seat for one of the official singers, situated in the choir or chancel. A stall is inclosed at the back, and with side-arms, and usually forms one in a row of such seats. One or more rows of these extended along each side of the choir of most churches before the Reformation: and fine examples remain in nearly all the cathedrals—generally inclosed at back with a high screen, and covered with canopies ornamented with pinnacles, etc. Stalls, now common for the singers in Episc. churches, are of less elaborate style. **STALL**, v. to place or keep in a stall; in *OE.*, to invest; to dwell. **STALL'ING**, imp.: N. in *OE.*, state of keeping in a stall. **STALLED**, pp. *stawld*. **STALLAGE**, n. *stawl'-āj*, right of erecting stalls at fairs: dung from a horse's stall. **STALL-FEEDING**, practice of keeping and feeding cattle in separate stalls in stables, or small inclosed and covered courts, where they are supplied with food. **STALL-FED**, a. fed in a stall, as an ox. **STALLED OX**, a fat ox.

STALLION, n. *stäl'yŭn* [OF. *estalon*; F. *étalon*, a stallion—from It. *stallone*, a horse long kept in a stable, a stallion—from OHG. *stal*, a stall (see STALL)]: horse kept for breeding; a stock-horse.

STALWART, a. *stawl'wért*, formerly also STAL'WORTH, a. *-wérth* [AS. *stelwyrth*, worth taking—probably from *steal* and *worthy*, which see]: large and strong in frame; tall and strong; sturdy; stout; brave; unyielding.

STALYBRIDGE, *stā'li-brĭj*: market-town and parliamentary and municipal borough, partly in Lancashire and partly in Cheshire, England; on the Tame, eight m. e. of Manchester. It is remarkable chiefly for cotton manufactures; but the print-works, iron-foundries, and machine-shops also are numerous and important. Free communication by railway is afforded in every direction. There are in S. 39 mills employing 10,000 hands, and 28 foundries and machine-shops, employing 1,100 hands. Pop. (1871) municipal borough, 21,092; (1881) 22,785; in 1881 its limits were extended from 806 acres to 3,120 acres, with total pop. 25,977; (1891) 26,783.

STAMBOUL': see CONSTANTINOPLE.

STAMEN, n. *stā'mĕn*, plu. STAMENS, *stā'mĕnz*, or STAMINA, *stām'ī-nă* [L. *stamen*, the standing thing, a thread as hanging from the distaff, the warp in the upright loom of the ancients; *stamĭna*, threads—from *sto*, I stand]: solid or firm part of a body: male organs of flowers, situated within the petals, and consisting of stalks or filaments, and anthers containing pollen (see below): basis; foundation. STAMENED, a. *stā'mĕnd*, furnished with stamens. STAM'INA, n. plu. that which constitutes the principal strength and support of a thing; tone or vigor of the animal system. STAM'INAL, a. *-năl*, pertaining to stamens or stamina. STAMINEOUS, a. *stā-mĭn'ĕ-ŭs* [L. *stamĭn'ĕus*, thready]: consisting of or having stamens. STAMINATE, a. *stām'ī năt*, or STAM'INIFEROUS, a. *-nĭf'ĕr-ŭs* [L. *fero*, I bear]: bearing stamens—applied to a male flower, or to plants bearing male flowers. STAM'INODE, n. *-ĭ-nōd*, or STAM'INO'DIUM, n. *-nō'dĭ-ŭm* [Gr. *eidos*, resemblance]: in *bot.*, an abortive or imperfect stamen. STAMINODY, n. *stām'īn-ŏ-dĭ*, conversion of other parts of the flower into stamens, perfect or imperfect.

STA'MENS: those parts in the flowers of phanerogamous plants which excite the pistil to the formation of the fruit, and thus effect fertilization or Fecundation (q.v.). A stamen consists of a receptacle—*anther*; which contains a dust—*pollen*—various in color, but generally yellow, and usually supported on a stalk—*filament*; the anther being the blade of a metamorphosed leaf, and the filament the leaf-stalk. The filament is, however, sometimes lacking, when the anther is said to be *sessile*. Each anther usually consists of two cells, forming two lobes, which, before they open to give forth the pollen, are again divided into two cell-like parts, and at the time of their maturity open by longitudinal clefts, by pores, or by valves, to scatter the pollen, which is conveyed to the stigma either by its own falling, by the wind, or by the insects which seek

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honey in flowers. See PISTIL. The pollen consists of single cells, which are usually free; more rarely, the



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pollen of each cell is united into a mass—*pollen-mass* or *pollinium*, as in the *Orchideæ* and *Asclepiadaceæ*. The stamens are found either with the pistil in the same flower, and are then arranged around it, in which case the flower is *hermaphrodite*; or by themselves in separate flowers, therefore called *male* flowers. The stamens are sometimes united together, generally by the filaments, which form a tube, when the flower is *monadelphous*; sometimes, by their union, they form two sets, when the flower is *diadelphous*; sometimes three or more, when it is *polyadelphous*; and the filaments are sometimes united with the pistil into a column, from which the anthers spring, as if growing from the pistil, when the flower is *gynandrous*. See BOTANY. The stamens form either one or more whorls, and when in one whorl are either opposite to the petals or alternate with them: the latter is regarded as their normal position. Sometimes, by abortion, there is only one stamen. Being leaf-organs, stamens arise from the axis; but they very frequently grow upon the corolla, so that they seem to have their origin from it. When the stamens seem to arise from the corolla or from the calyx, they, also the flower, are said to be *perigynous* [Gr. *peri*, around, and *gyne*, a wife]; when they grow from the pistil, they are *epigynous* [Gr. *epi*, upon]; and when from beneath it, *hypogynous* [Gr. *hypo*, under]. These distinctions have been much used in classification by Jussieu and others. The transition of petals into stamens can be easily traced in some flowers, e.g., the Water Lily. In double flowers, the stamens have been changed into petals. Linnæus adopted the stamens as the means of his division of plants into classes (see BOTANY); but so far as the classification was founded on their mere number, it was artificial, the number of stamens being various in plants very closely allied. Stamens are among the organs of plants which most frequently display Irritability (q.v.).

The filament assumes great variety of forms. Sometimes it is short and thick, sometimes long and slender; sometimes dilated at the base; sometimes petal-like, with the stamen at its tip; sometimes forked, or divided into three teeth, of which the central one bears the anther; sometimes bent or jointed, sometimes spiral. The form of the anther varies still more than that of the filament; indeed, the variety of forms is endless. The *connective* is a body which

unites the lobes of the anther. When the filament is continuous with the connective, the anther-lobes seeming to be united to it through their whole length, the anther is said to be *adnate* or *adherent*; when the filament ends at the base of the anther, the anther is *innate* or *erect*. In many flowers, as in those of grasses, the anther is attached to the filament by a mere point, and is very movable, easily turned by the wind: it is then said to be *versatile*.

STAMFORD, *stām'fērd*: town, in Fairfield co., Conn.; on Long Island Sound, and on the New York New Haven and Hartford railroad; 22 m. w.s.w. of Bridgeport, 32 m. n.e. of New York. It is beautifully situated, with a fringe of hills on which many elegant residences have been built by people doing business in New York, and has become a popular summer resort. It was settled by a colony from Wethersfield 1640; was known first as Rippowam; subsequently included the town of Darien, part of New Canaan, North Castle, Pound Ridge, and Bedford; and was incorporated as a borough 1830. In 1890 it had 15 churches; brick and stone town hall (cost \$140,000); 3 public halls; trotting park; public park with handsome fountain; gas and electric light plants; water supply from a lake several m. n., with pressure sufficient for fire purposes; public-school property valued at more than \$300,000; Betts' Milit. Acad. and King's School for Boys, both non-sect., and with grounds and buildings valued at \$25,000; 2 national banks (cap. \$402,000); 2 sav. banks; and 5 weekly periodicals. The manufactures include Yale locks, billiard tables, woolen goods of various kinds, lumber, straw hats, stoves, carriages, wax, camphor, 'milk of magnesia,' fire-brick, drain pipe, and medicinal preparations. Pop. (1880) 11,297; (1890) 15,685; (1900) 15,997.

STAMFORD: market-town and municipal borough of Lincolnshire (but partly also in Northamptonshire), England; on the Welland, navigable from S. to the sea; 11 m. n.w. of Peterborough, 55 m. s. of Lincoln, 89 m. n. of London. Agriculture is almost the exclusive pursuit in the district around. S., a town of remote antiquity, is remarkable chiefly for its ancient remains. It appears in history first in 449, when the Britons and Saxons here defeated the Picts and Scots. Many of the Jews of S. were slain, and their whole community plundered 1190 by those who had enlisted for the Crusade. In the middle ages several parliaments and councils were held here, and the town contained about 16 churches, and a number of religious houses. In 1572, some Flemish Prot. refugees settled here, and introduced the weaving of silk and serge. Portions of the walls and gates of the Carmelite and Franciscan priories, and other curious remains, are still extant. There are numerous schools and charitable institutions—some ancient. In the reign of Henry III. colleges were erected for the Carmelite lecturers, and S. became an educational centre transiently rivalling Oxford and Cambridge.—Pop. (1871) 7,846; (1881) 8,993; (1891) 8,358.

STAMINA: see **STAMEN**.

STAMMER.

STAMMER, v. *stām'mēr* [Goth. *stamms*; Icel. *stamr*; AS. *stamer*, stammering; Dan. *stamme*; Dut. *stameren*, to stammer]: to utter words with hesitation, and imperfectly; to speak hesitatingly and with difficulty from an impediment in speech; to stutter (see below): N. a difficulty in pronouncing; an impediment in speech; a stutter. **STAMMERING**, imp.: ADJ. speaking with difficulty: N. a stuttering or imperfect utterance in speech. **STAM'MERED**, pp. *-mērd*. **STAM'MERER**, n. *-mēr-ēr*, one who speaks with difficulty. **STAM'MERINGLY**, ad. *-lī*—*Stammering* and *Stuttering* are affections of the vocal and enunciative organs, causing hesitancy and difficulty of utterance. The term stuttering is often used synonymously with stammering; but is properly, or at least conveniently, limited to a loose and imperfect action of the organs of articulation; as distinguished from the irregularity of breathing and the convulsive and choking symptoms which invariably accompany stammering. In stuttering, the organs meet and rebound again and again in reiteration of syllables before words can be fully formed. The source of this difficulty is mainly in the lower jaw: when this organ is brought under control, and the effort of speech is transferred from the mouth to the throat—where all voice is formed—the power of fluency is readily obtained. But stuttering is rarely unaccompanied by some degree of spasmodic stammering; and the two forms of impediment, theoretically distinct, are generally blended in mutual aggravation.

Regarding the nature and origin of these defects, opinions have varied. Stammerers themselves often attribute the varying conditions of their impediment to causes purely imaginary, such as the state of the wind, the changes of the moon, etc. The impediment is certainly aggravated by depression of spirits, derangement of digestion, physical debility, etc.; but these influences have nothing to do with the primary cause of the infirmity. A nervous dread of speaking is usually associated with stammering; but this is rather the result than the cause of the impediment. If constitutional nervousness alone were productive of stammering, the number of sufferers would be vastly greater, and it would include a larger proportion of females than of males; whereas the robust sex furnishes by far the greater number of cases; and it is noticeable, besides, that stammerers are not, in general, persons of weak nerves, otherwise than in connection with the act of speaking. Any physical defect will render a person nervous when the peculiarity is made a subject of observation; and in this way only is nervousness associated with speech in cases of stammering. The strength of this impediment—whatever its origin—lies in *habit*, in mismanagement of the breath and of the organs of utterance, rendered habitual before the development of reason and observation and application of the force of will; and its removal depends on the acquirement of voluntary control over the mechanical agents of speech. The nervousness which unfits the stammerer for self-direction gradually subsides as his will attains mastery over the processes of speech; and perseverance in a dis-

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cipline of systematic and guarded utterance rarely fails to remove the impediment, and the fear which accompanied it.

The first manifestations of stammering take place usually during the weakness attendant on disease, or after a fall or sudden fright; but sometimes the impediment appears to arise from imitation, and children have been known to be infected by even the most casual example. Thus, when one member or visitor of a family stammers, the younger members of the family are very apt to be similarly affected. From this cause defects of speech run so much in families, that stammering has by some authors been deemed hereditary. In the early stages, a little patient direction on the part of parents and nurses would suffice to check the tendency to stammer, and prevent the habit.

Stammering begins generally about the fourth or fifth year of age; but harshness in checking children, or impatience in connection with messages or lessons, may induce it at a considerably later period. Boys of 10 or 11 years have been excited into the habit by injudicious hurry and peremptoriness at school. The little stammerer, when he cannot be more directly assisted, should be kindly counselled to take time and speak slowly; he should never be ridiculed or reproved for what he cannot avoid, and is not taught how to avoid.

The varieties of stammering are so great, that few cases are found precisely alike. In some there is little outward manifestation of effort; in others, the futile attempts are painfully demonstrative. The silent straining to speak causes the eyeballs to protrude, and the veins of the face and neck to swell, till relief from apparent choking comes in fitful, ungovernable bursts of sound. In severe cases the head oscillates loosely on the neck, and is forced upward by the misdirected current of breath; while the larynx, the organ of sound, is from the same cause agitated in continual efforts to ascend, and the voice is consequently abrupt and intermittent, and unnaturally acute. The muscles of the face participate in the general upward action, and sometimes the spasmodic contortions extend over the whole body, causing the stammerer to rock in his chair, or start wildly to his feet. These muscular disturbances arise simply from disordered respiration, and they disappear when the habit of closing the glottis and compressing the organs of articulation is overcome, and the air is allowed to pass freely in or out of the lungs.

Stammering is, in nearly every case, perfectly curable, as it arises seldom from organic defect, but almost always from lack of just coördination between the several organs concerned in speech—the muscles of larynx, glottis, tongue, cheeks, jaws, lips, etc. The means of cure must often be continued for a length of time before the stammerer is free from danger of relapse. The best time for the cure is undoubtedly the earliest, before the habit has acquired full strength, and before the sufferer has endured the most grievous mortifications and drawbacks of the impediment.

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But the adult stammerer generally brings to the curative task a higher appreciation of its importance, and a greater care and concentration of effort than the child is capable of; and these qualities almost compensate for the disadvantage of long habit. Parents often unwisely defer the attempt to correct impediments of speech, in the hope that the defects will disappear as the child gains strength and reaches riper years; but the hope is rarely realized; and it would have been better to avoid the years of infirmity.

The means proposed for cure of stammering are many and various; and sometimes the 'cure' has been little better than the disease. Drawling, singing, interpolations or elisions of letters, speaking with the teeth closed, or with the tongue pressed to the roof of the mouth, sniffing, whistling between words, beating time to utterance, stamping the foot, jerking the body, forks on the tongue, pebbles in the mouth, or tubes fixed between the organs, bands compressing the larynx, and other absurd and uncouth devices, have been practiced. But the cure depends upon the skilful application of scientific principles, whose only mystery is that which arises from the little attention given to the science of speech. It is almost superfluous to add that the cure is not within the province of surgery. Yet the barbarous operation of cutting a wedge from the root of the tongue, and the equally futile and cruel operation of excising the tonsils, have been, within no distant date, practiced by surgeons in this country.

The habit of stammering can be counteracted only by cultivation of its opposite habit of correct speaking; and this can be acquired only by due regard to the processes of speech, the relation of breath to articulate sounds the positions of the tongue and other oral organs in molding the outward stream of air; and by patient application of these principles in slow and watchful exercise. The lungs constitute a pair of bellows, and the mouth, in all its varying shapes, the nozzle of the bellows. The passage of the throat must be kept open, and the breath expelled by means of the ascent of the diaphragm, not by downward pressure of the chest. All sound originates in the throat, and all effort in speech must be thrown back behind the articulating organs, which must be kept *passive*, yielding to the air; always opening to give it exit, and never resisting it by ascent of the tongue or of the jaw. The head must be held firmly on the neck, to give free play to the attached organs; and the great principle must never be lost sight of that *speech is breath*; and that, while distinctness depends on precision and sharpness of the oral actions, *fluency* depends on the unrestrained emission of the material of speech—the air that we breathe.

Defective Speech in general.—Besides stammering and stuttering, there are many other forms of vicious articulation, which are rather defects than impediments of speech. The elementary sounds most subject to mispronunciation are those of *r* and *s*, giving rise to the common defects of burring and lispings. Burring consists in vibrating the uvula or the edge of the soft palate, instead of the tip of

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the tongue; and lisping consists in applying the tongue to the teeth or the gum, thus intercepting the breath, and forcing it over the sides instead of the centre of the tongue. The sound of *l* also is often defective, *w*, *y*, *ng*, or a vowel being substituted for the lingual articulation. Other substitutions of one element for another are common, such as *t*, *d*, and *n*, for *k*, *g*, and *ng*; *s* or *z* for *th*; *s* for *sh*; etc. There are defects also which arise from organic malformation, and require the aid of surgery; as when fissure exists in the palate, and the breath cannot be inclosed behind the lips or tongue, but escapes into the nostrils; when the tongue is too closely tied to the bed of the mouth, and the tip cannot be raised to the palate; when the teeth are so irregular or abnormally numerous as to leave the tongue too little room to act; etc. In some cases the breath escapes into the nostrils when there is no organic cause for the peculiarity, and *r*, *l*, *s*, and other elements are nasally affected, merely from habit. The nasal passages are in other cases insufficiently free, and *m*, *n*, and *ng* are scarcely distinguishable from *b*, *ā*, and *g*.

There are comparatively few persons who have perfect command over their vocal organs. Speaking, which is in reality an art, is exercised only as an instinct; and thus, as Dr. Rush observes, 'some men only bleat, bark, whinny, or bray a little better than others.' It is some consolation to those who have been compelled by their defects to study the art of speech, that they exercise this crowning function more worthily than others, and thus acquire, perhaps, a better utterance than they would have had without the stimulus of impediment.

Speaking, when the respiration is properly conducted, is one of the most healthful exercises; but violent or long-continued effort is injurious to the chest, when the lungs are not kept well inflated. Frequently, also, under such circumstances, the vocal chords become permanently relaxed, and total loss of voice sometimes ensues.

The acquirement of the power of speaking in infancy is dependent on the possession of hearing, so that deaf children are also mute. Under proper training, however, they may be taught to articulate, as the organs of speech are very rarely imperfect. Children who have been subject to fits or other cerebral affections, or who are deficient in imitative power, are sometimes very backward in learning to speak. In such cases great care is requisite to direct the early attempts and prevent the formation of bad habits. Many of the worst forms of defect and impediment owe their origin simply to lack of proper direction in the production of elementary sounds, when the little sufferers have failed to enounce them correctly by natural imitation.

Of the systems of cure for impediments of speech at the present day, those of Dr. Hunt and Melville Bell have been most fully published. The views of these authors differ but little, and in substance this article agrees with them.

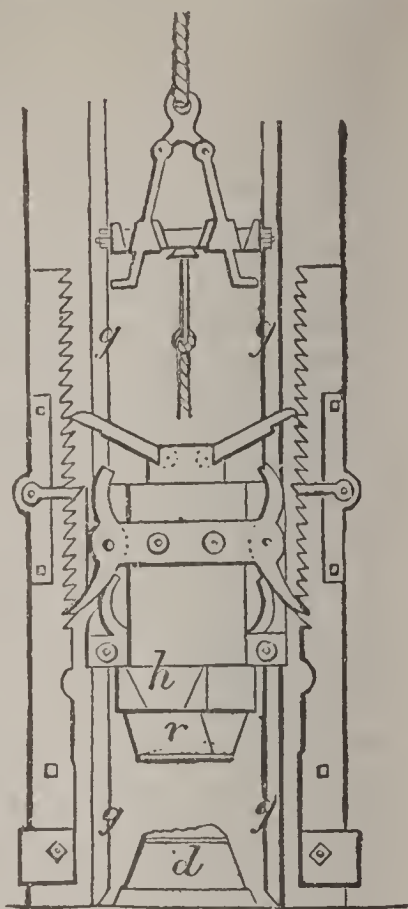
STAMP—STAMPEDE.

STAMP, n. *stämp* [Icel. *stappa*, to stamp, to thrust with a pole: Norw. *stampa*, to tramp in mud: Dut. *stampen*, to ram, to pound: Ger. *stampfen*, to stamp]: tool or instr. for making impressions or marks on substances, generally of figures or devices (see **MINT**); the mark impressed; a thing marked or stamped: in *taxation*, small piece of paper having a certain value impressed by govt., used for attaching to a paper, letter, or document liable to duty, known as **STAMP-DUTY**; used also in the United States, by law, to be attached to a few special kinds of goods subject to revenue tax—notably tobacco, cigars, beer, whisky: instr. for cutting or shaping material into any required form by a blow or pressure (see **STAMPING OF METAL**): authority; make; cast; character; current value: V. to strike or beat forcibly, as with the bottom of the foot; to strike the foot downward; to impress with a mark or figure; to put a government stamp on; to fix deeply, as on the mind; to coin; to cut into forms by a stamp; to crush by downward pressure, as ore in a stamping-mill; in *OE.*, to form; to mint. **STAMP'ING**, imp.: N. the act of one who or that which stamps. **STAMPED**, pp. *stämpt*. **STAMP'ER**, n. *-ér*, one who or that which stamps. **STAMP-DUTY**, originally, and in England still, tax imposed on all paper or parchments used for private deeds or other legal instruments (see **STAMP ACT**). **STAMP-OFFICE**, govt. office for issuing of stamps, and reception of the revenue derived from them. **STAMPING-MILL**, a mill for pounding ores (see **METALLURGY**). **OF THE RIGHT STAMP**, possessed of genuine merit.

STAMP ACT: specific name of a statute in Great Britain of 5 and 6 William and Mary, c. 21, by which taxes were imposed on all parchment and paper whereon private deeds and other legal instruments were written: its details have been altered by subsequent legislation, but its principle is still in effect.—The S. A., noted in U. S. colonial history, was an act of the Brit. parliament 1765, Mar. 22, requiring that every written agreement in the American colonies should bear a stamp. It led to the assembling of a colonial congress in New York Oct. 7, which expressed the determination of the people to resist the imposition. Several of the colonies also protested individually. The act was repealed within a year from its passage.

STAMPEDE, n. *stäm-pēd'* [Sp. *estampido*, a crash: Dut. *stampen*, to stamp the ground with the feet (see **STAMP**)]: a sudden fright seizing large bodies of horses or cattle, and causing them to run furiously; any sudden flight arising from a panic: V. to take to sudden flight; to cause to take to sudden flight.

STAMPING OF MET'AL: operation in various mechanical departments. For the stamping of coins or medals, see **MINT**: for preparation of the dies used, see **DIE-SINKING**. For ordinary stamped brass-work a stamping-machine is employed, of which the essential parts are a *die*, a *reverse* or counter-die, and a *hammer*. It is shown in the annexed figure; but the toothed rack, with arrangement for catching the hammer after it rebounds, is used only for special purposes. The die, *d*, of cast-iron or steel, is fixed to the bottom of the stamp, and the reverse, *r*, is attached to the hammer, *h*, which works between two guides, *g, g*. Pieces of thin rolled brass are cut to size, and one is placed upon the die; the hammer, with the counter-die, is now raised to sufficient height by a windlass and rope, or other means, and allowed to fall, and thus force the thin plate into the die. The plates from the first blow are then annealed. Repeated blows and annealings follow until the article is 'brought up,' slight alterations in the reverse being from time to time required. Sometimes as many as 30 blows are necessary, but 10 or 12 strokes will suffice for an object with considerable depth of stamping. Globular articles are stamped in two or more pieces, and then soldered together.



Stamping-machine.

The stamping process was adapted to the production of hollow shapes in sheet-iron 1841, and since then the manufacture of such goods as dish-covers, basins, teapots, bowls, pans, kitchen-utensils, etc., has been surprisingly improved and extended. The stamping-machine with hammer action, however, is now generally superseded by the 'stamping-press,' in which the work is done by continuous pressure, exerted by a screw, a toggle-joint, or the like. For stamping-machines used in dressing metallic ores, see **METALLURGY**.

STANCE, n. *stâns* [OF. *estance*, a station—from mid. L. *stantia*, a house, a chamber—from L. *sto*, I stand]: in *Scot.*, a site; an area for the erection of a building.

STANCH, v. *stânsh* [OF. *estancher*, to stop the flow of a liquid—from mid. L. *stancârě*, to stop the flow of blood, a variant of L. *stagnârě*, used in the same sense (see **STAGNATE**): Sp. *estancar*, to stop a leak; *stanco*, water-tight; Bret. *stanka*, to stop a hole: Prov. *estanc*, firm, stable]: to stop the flowing of blood; to cease to flow, as blood: **ADJ.**, also **STAUNCH**, *stânsh*, sound; firm; steady; sound and

STANCHEL—STAND.

strong; strong and firm in principle; not to be broken; constant; zealous; strong, as a dog following the scent without error. STANCH'ING, imp. STANCH'ED, pp. *stāncht*. STANCH'LESS, a. -*lēś*, that cannot be stopped or stanch'ed. STANCH'ER, n. -*ēr*, one who or that which stanches. STANCH'LY, ad. -*lī*, firmly. STANCH'NESS, n. -*nēs*, firmness; steadiness; soundness.

STANCHEL, n. *stān'shēl*: the same as STANCHION.

STAN'CHIO, or STAN'KO: see Cos.

STANCHION, n. *stān'shūn*, or STANCHEL [OF. *estanchon*, a prop; *estance*, a station, a stanchion—from L. *sto*, I stand: W. *ystanc*, a holdfast]: prop or upright support. Stanchions in the form of upright iron bars are often fixed in the stone-work to protect windows; sometimes let into the stone at top and bottom; sometimes at bottom only, and ornamented with fleurs-de-lis, etc., at top.

STAND, n. *stānd* [AS. *standan*, *stondan*; Goth. *standan*; Icel. *standa*, to stand: Dan. *stade*, stand, station: L. *stans*, standing; *sto*, I stand: Skr. *sthā*, to stand]: a point beyond which a person does not, or cannot, proceed; a place in which to remain for any particular purpose; a station; a difficulty or perplexity; a stop; a halt; that on which a thing rests or is laid; a building or scaffolding placed to command a view, as of a procession or horse-race; a state of cessation from action or business: V. to be in an upright position, as on the feet; to be erect; to become erect; to be placed or situated; to be in a particular relation, as to *stand* as godfather; to depend; to rest; to stop; to halt; to continue; to remain; to endure; to succeed; to persist; to insist; to maintain one's ground; not to fail; not to yield or fly; to offer one's self as a candidate; to place one's self; to stagnate; to withstand; to await; to abide; in *slang*, to pay for, as to *stand* a treat; in *OE.*, to have a place; to be resolutely of a party; to remain satisfied. STAND'ING, imp.: ADJ. continuing erect; not cut down; settled; fixed; established; not transitory; not flowing; not cast down: N. rank or station, as a man of *standing*; continuance; long possession; place; power to stand; station; a place to stand in. STOOD, pt. and pp. *stūd*. STAND'ER, n. -*ēr*, one who stands. A STANDER-BY, a mere spectator; one present. A STAND-STILL, inability to move. To STAND AGAINST, to oppose; to resist. To STAND BY, to be near; to defend; to support. To STAND FAST, to be unshaken or immovable. To STAND FIRE, to receive an enemy's fire without giving way. To STAND FOR, to offer one's self as a candidate; to side with; to maintain; to be in the place of; to represent; to sail toward. To STAND FROM, to sail away from. To STAND IT, stoutly to endure; to maintain one's ground. To STAND OFF, to keep at a distance. To STAND OFF AND ON, to sail toward land and then from it, as a ship. To STAND ON, to continue on the same tack or course. To STAND ONE'S GROUND, to maintain one's station or position. To STAND OUT, to project, as from a wall; to resist; to sail from land. To STAND TO, to persevere; to abide by; to be consistent with, as to *stand* to one's word. To STAND TOGETHER, to be consistent; to agree. To STAND TO SEA, to direct the

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course from land. To STAND UP, to rise from a sitting position. To STAND UP FOR, to justify; to support. To STAND UPON, to value; to pride one's self on. To STAND WITH, to be consistent. IT STANDS TO REASON, a familiar phrase, meaning, 'it could not reasonably be otherwise' To MAKE A STAND, to halt for the purpose of offering resistance to an enemy, or in a matter of duty or principle. To PUT TO A STAND, to embarrass; to perplex. A STAND OF ARMS, a firearm with its customary appendages, as bayonet, etc. STANDPOINT, a fixed point or station; a position from which a matter may be viewed. STAND-UP, a manfully contested, as a *stand-up* fight. BYSTANDER, one standing near; a mere spectator. STANDING ORDERS, rules for conduct of business in a legislative body (see below).—SYN. of 'stand, n.': station; place; rank; post; stop; halt; interruption; point; perplexity; embarrassment; hesitation; difficulty; rest; obstruction.

STANDARD, n. *stănd'ërd* [OF. *estandard*; It. *standardo*, a standard—from OHG. *standan*, to stand]; *formerly*, a lofty pole borne in a car or fixed in the ground, marking the headquarters of an army, and usually bearing a flag with suitable devices; an upright without a flag; a staff and flag; the colors; an ensign (see below): that which is established by government as a rule, measure, or model; settled rate; fixed value; a test: that which is of undoubted excellence: standing tree or stem, as distinguished from a wall-tree; in *carpentry*, an upright support; the quarters or upright posts in wooden partitions; *door-standards* are the upright timbers to which doors are hung: in *ship-building*, an inverted knee placed upon the deck instead of beneath it: in *coinage*, the proportion of weight of fine metal and alloy established by authority (see ALLOY: MINT): ADJ. having a fixed and permanent value; not of the dwarf kind, as a tree. STAND-ARD-BEARER, in *mil.*, officer who bears a standard. STAND-ARD TIME (see HOROLOGY).—SYN. of 'standard, n.': ensign; flag; streamer; banner; pennant; criterion; rule; test.

STAND'ARD: in its widest sense, a flag or ensign under which men are united together for some common purpose. The use of the S. as a rallying-point in battle dates from remote ages. The Jewish army was marshalled with the aid of standards belonging to the four tribes of Judah, Reuben, Ephraim, and Dan; and the Egyptians had ensigns with representations of their favorite animals. The flag of Persia was white, and according to Xenophon, bore in his time a golden eagle with expanded wings; it was fixed on a chariot, and thus conveyed to the field of battle. Æschylus, in enumerating the six chiefs who, headed by Polynices, set themselves in battle array against Thebes, describes the device on the standard of each. In the earliest days of Roman history, a bundle of hay or fern is said to have been used as a military S., which was succeeded by bronze or silver figures of animals, on a staff, of which Pliny enumerates five—the eagle, the wolf, the minotaur, the horse, and the boar. In the second consulship of Marius, B.C. 104, the other animals were laid aside, and only the eagle retained; and

till the time of the later emperors, the eagle, often with a representation of the emperor's head beneath it, continued to be carried with the legion. On the top of the staff was often a figure of Victory or Mars. Each cohort had also an ensign of its own, consisting of a serpent or dragon woven on a square piece of cloth, and elevated on a gilt staff with a cross-bar. Under the Christian emperors, the *Labarum* (q.v.) was substituted for the imperial S. Various standards of great celebrity occur in mediæval history, among which are the Flag of the Prophet (q.v.); the S. taken from the Danes by Alfred of England; and the Oriflamme, belonging originally to the Abbey of St. Denis, and borne by the Counts of Vexin, which eventually became the S. of the French kingdom.

In strict language, the term is applied exclusively to a particular kind of flag, long in proportion to its depth, tapering toward the fly, and, except when belonging to princes of the blood-royal slit at the end. Each baron, knight, or other commander in feudal times, had a recognized S., which was distributed among his followers; the length varied according to the rank of the bearer. A king's S. was 8 to 9 yards in length; a duke's, 7 yards; a marquis's, $6\frac{1}{2}$ yards; an earl's, 6 yards; a viscount's, $5\frac{1}{2}$ yards; a baron's, 5 yards; a banneret's, $4\frac{1}{2}$ yards; and a knight's, 4 yards. There was never a complete coat-of-arms on the S.; it generally exhibited the crest or supporter with a device or badge of the owner, and every English S. of the Tudor era had the cross of St. George at the head. Standards were registered by the heralds, and the charges on them selected and authorized by an officer of arms. The so-called Royal S. of Great Britain is more properly a Banner (q.v.), being a square flag with the national arms covering the entire field without any external accessories. The so-called cavalry standards in use in the British army are also in strictness banners.—In the United States army every mounted regt. has a standard of silk bearing the national arms on a blue ground, with the number of the regt. beneath the eagle.—See FLAG: BANNER: COLORS, MILITARY: ENSIGN.

STAND'ARD, BATTLE OF THE: between the English and Scots, on Cutton Moor near Northallerton, 1138, Aug. 22. On the usurpation of Stephen, David I. of Scotland, who, with Stephen, had sworn to defend the rights of Matilda, daughter of Henry I., invaded England in pursuance of his oath, and compelled the barons of the n. part of the kingdom to swear fealty to that princess. After a war of nearly three years David met the English troops at Cutton Moor. His large but undisciplined army, partly in consequence of a rumor that the king was slain, were thrown into confusion, and the most disastrous rout followed, in which the Scots are said to have lost 10,000 men. The battle was named from the fact that a ship's mast, elevated on a wagon, and bearing on its top the consecrated host, and surrounded by the banners of St. Peter of York, St. John of Beverley, and St. Wilfred of Ripon, marked as a standard the centre of the English army.

STANDING ORDERS: permanent regulations for conduct of business in a legislative or a deliberative body. In the British house of commons the S. O. are held to be in force from parliament to parliament unless rescinded; in the U. S. house of representatives each new house establishes its own S. O. or rules: in the U. S. senate the rules are in force continuously until repealed: The time of debate is limited in the U. S. house of representatives by the 'previous question;' no such rule exists in the senate. In the British house of commons there was no standing order for limiting debate till 1887, when the rule of 'closure' was adopted, according to which a debate may be ended and the main question put to vote.

STANDING STONES: large rude unhewn blocks of stone, artificially raised to an erect position at some remote period, have been found in almost every region inhabited by man—in Britain, continental Europe, Assyria, India, Persia, n. Africa, Mexico; and they are generally of such size that their erection must have required some skill in the use of mechanical power. They are abundant in Brittany and in the British Isles, where they stand sometimes singly, sometimes in more or less regular groups; and it was long the general opinion of archeologists that they were connected with the Druidical worship of the Celtic races. Modern investigation has thrown doubt on the Druidical theory, yet no other explanation has been given which is in all cases satisfactory. The erection of a large stone not easily shifted from its place is perhaps the earliest mode which man's instinct would contrive of preserving the memory of an event or of a hero; and there can be no doubt that many of these monoliths mark the site of a grave or of a battlefield. Human skeletons, and bronze and iron weapons, have in numerous cases been found underneath them. A traditional remembrance of this origin is preserved in the name 'Cat Stane' [from Celtic *cath*, battle], given to some of them in Scotland, and 'bauta stein' (battle stone) in Norway. Another possible purpose is preserved in the Scottish name of 'hair stane' or boundary stone, by which they are occasionally known; not a few of them, whatever their original object, having been long used as landmarks, and being alluded to as such in very early charters. A third use of these monoliths is at least as old as the historical books of the Old Testament. We read in Judges ix. 6, of Abimelech being made king 'by the pillar which was in Shechem;' and in II. Kings xi. 14, of Joash, when he was anointed king, standing 'by a pillar, as the manner was;' and a like usage prevailed in ancient Britain, where the king or chief was elected at the 'Tanist stone' [from *Tanist*, the heir-apparent among the Celts], and there took a solemn oath to protect and lead his people. A very celebrated stone of this kind was the Lia Fail of Ireland, brought to Icolmkill for the coronation of Fergus Erc; which after being removed to Scone, became the coronation stone of Scotland, till conveyed by Edward I. to Westminster, where it now forms part of the coronation chair of the sovereigns of the United Kingdom. In

all these cases there is an idea of a solemn religious sanction attached to the stone; and a peculiar degree of sacredness seems to have invested any contract entered into at one of these perforated stones which are or were occasionally seen in England and Scotland. Such a stone, with an oval hole large enough to admit a man's head, till within recent years adjoined the monolithic group of Stennis in Orkney; it was known as the 'Stone of Odin,' and till the middle of the 18th c. was the scene of the interchange of matrimonial and other vows—he who broke the vow of Odin being accounted infamous. It is said to have been the popular belief that any one who had in childhood been passed through the opening would never die of palsy. The power of curing rheumatism was ascribed to a perforated stone at Madderty in Cornwall. While many of the monoliths in Britain are undoubtedly of very remote age, there are some indications that the practice of erecting them continued for a time after the introduction of Christianity, and that they were used to subserve purposes connected with the new faith.

Still more puzzling to archeologists than the single monoliths are the large symmetrical groups of them, of which the most remarkable are Stennis in Orkney, Stonehenge and Avebury in Wiltshire, and Carnac in Brittany; all which, till lately, existed comparatively entire, though they all have been more or less despoiled for building purposes. The most imposing of these monuments is Stonehenge (q.v.). At Stennis, 70 to 80 stones were grouped in two separate circles of 360 and 100 ft. diameter respectively, the larger stones being in the smaller circle. At Avebury, two double concentric circles were surrounded by an outer circle of 100 stones, the whole being approached by two long avenues of stones in double lines. In all these, and other instances, the circles were surrounded by a trench and mound. At Carnac the stones are not in circles but in straight lines, with a curved row at one end—an arrangement which has suggested the idea of a burial-place on the site of a great battlefield. All around Carnac, as well as Stonehenge, Barrows and Cromlechs (q.v.—see also DOLMEN) are found. While the popular notion of all these monuments is that they were Druid temples, the circular form so frequent among them has suggested also that they may originally have been connected with sun-worship: it is possible that they may have been used in turn for the successive religious worship of different races. They seem also to have served the purpose of courts of justice, or battle-rings for the duel and judicial combat. See STONEHENGE.

A remarkable kind of monument, whose purpose is utterly unknown, is the *Rocking-stone* or *Logan-stone* (q.v.). For a notice of a class of standing stones ornamented with peculiar sculpture and found largely in Scotland, see SCULPTURED STONES.

STANDISH, n. *stănd'ish* [from STAND and DISH, which see]: a case for pens and ink; an inkstand.

STANDISH—STANFIELD.

STANDISH, *stănd'ish*, MILES: 1584 (?)—1656, Oct. 3; b. Lancashire, England: Pilgrim captain. He is thought to have been of the old S. family of Duxbury Hall, of whom two Sir John S.'s were distinguished soldiers. While on army service in the Netherlands, he became attached to the Pilgrim band, and with them sailed in the *Mayflower*, 1620. Five days after arrival, he began a series of explorations in the vicinity with a few armed men. In 1621 he explored Massachusetts Bay. In 1622 he rescued a colony at Weymouth, decoying and killing two hostile chiefs by Massasoit's advice, and terrifying the Indians in a battle ensuing. He went to England on a mission for the relief of the Plymouth colony 1625. Three years afterward he arrested Thomas Morton (an adventurer who had planted a riotous settlement at 'Merry Mount,' now Braintree) for instructing Indians how to use firearms. He failed, 1635, to drive away from Penobscot the French, who had driven away a Plymouth company. In 1632 he settled with a few Pilgrims at Duxbury, and, though not a church-member, was elected to town and colonial offices. His wife Rose died 1621; and he married her sister Barbara after the failure of his proxy courtship of Priscilla Mullens. He left 4 sons. He was a brave, useful man, and his monument, 100 ft. high, with statue, stands in Duxbury on Captain's Hill, where his house stood, and where he is supposed to have been buried.

STANFIELD, *stăn'fēld*, WILLIAM CLARKSON: marine painter: 1794–1867, May 18; b. Sunderland, England. In youth he went to sea, and made frequent long voyages as a common sailor—passing some years in the China seas. Capt. Marryat, who met him in the Mediterranean, serving in a king's ship as captain's clerk, observed his gift for drawing and painting. S., having left the navy in consequence of an injury to his feet through a fall from the fore-topgallant masthead of his ship, took to scene-painting as a means of earning his bread. His first efforts were in the Old Royalty, a sailors' theatre in Wells Street, Wellclose Square, in the e. end of London, about 1818. He was afterward employed at Drury Lane Theatre, where, it is said, he produced some of his most extraordinary effects. He carried on this occupation for about nine years, meanwhile not neglecting easel-painting. The first picture by him that attracted considerable notice was *Market-boats on the Scheldt*, exhibited at the Brit. Institution 1826. The picturesque grouping, variety of figures, and gay costumes were much admired. His *Wreckers of Fort Rouge, Calais*, 1827, also at the Brit. Institution, was even more successful. In 1828 he obtained from the Institution a prize of 50 guineas for another of his pictures. In 1830 S. made his first excursion on the continent, and exhibited at the Acad. his *Mount St. Michael, Cornwall*, which placed him in the front rank of marine painters. In 1823 S., with David Roberts and others, founded the Soc. of Brit. Artists. His election to the Acad. as associate was in 1832; and 1835 he was chosen R.A. In 1833 S. exhibited at the Acad. the first of a series of pictures of Italian scenery,

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painted for the Marquis of Lansdowne. In 1834 he began a similar series for the Duke of Sutherland. In 1836 he exhibited *The Battle of Trafalgar*, painted for the Senior United Service Club; and 1841 his celebrated *Castello d'Ischia*, engraved by the Art-union 1844. In 1843 he sent to the Acad. *Mazerbo and Lucello, Gulf of Venice*, said to be one of his finest landscapes. *A Skirmish off Heligoland* (1867) was S.'s last contribution to the Acad. His great merit is in skilful combination of land and sea in the same view. Man and the works of man are not omitted, and there is frequently a high poetic feeling in his conceptions, as in his pictures of *The Abandoned* and *The Wreck of a Dutch East Indiaman*. His pictures, never quite losing the scenic touch, are effective in composition, and both artistic and powerful in handling.

STANFORD, stăn'fêrd, LELAND: financier; 1824, Mar. 9—1893, June 20; b. Watervliet, N. Y. He was brought up on a farm; studied law, was admitted to the bar, and began practicing in Port Washington, Wis., 1849; lost his law library and other property by fire 1852; and, removing to Cal., became associated in business with his brothers, who had preceded him to that state, and acquired a great fortune. In 1860 he was a delegate to the national republican convention; 1861 was elected gov. of Cal. and pres. of the Central Pacific Railroad Co.; 1869, May, drove the last spike in the railroad constructed over the Rocky Mountains; 1885 was elected U. S. senator; and 1891, Jan., was re-elected. As a memorial to his deceased son, he erected at Palo Alto the 'Leland Stanford Junior University' (q.v.)—endowed by him with \$20,000,000, and designed to provide the usual collegiate courses, together with a large variety of practical branches of education for both sexes. The corner-stone was laid 1887, May 14, and the univ. was formally opened 1891, Oct. 1.

STANG, n. stång [Icel. stöng; Dan. stang, a bar, a staff; Icel. stanga, to strike with the horns, to goad]: an instr. of thrusting; a long bar or wooden pole; an old measure of land. To RIDE THE STANG, to be mounted on a strong pole, borne on men's shoulders, and carried about from place to place—a kind of lynch law formerly inflicted on wife-beaters, henpecked husbands, etc.

STANHOPE, stăn'op, Lady HESTER LUCY: 1776, Mar. 12—1839, June 23; b. Chevening, in Kent; eldest daughter of Charles, third Earl S. (1753–1816). and his wife Hester, daughter of the great Lord Chatham. She grew up to be a woman of great personal charm and of unusual force and originality of character, inheriting her father's impetuosity and honest uncompromising directness, with the domineering tendency of her grandfather, the first Lord Chatham. Very early she went to reside with her uncle, William Pitt, and as mistress of his establishment, and his most trusted confidante during his season of power and till his death, she had full scope for the exercise of her imperious and queenly instincts. On the death of Pitt, a pension of £1,200 a year was assigned her by the king

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Mr. Fox proposed to provide for her much more munificently, but she proudly declined his offers, as unwilling to accept benefit at the hands of the political enemy of her dead uncle. The change from the excitements of a public career, as it might almost be called, to the life of an ordinary woman of her rank with means somewhat insufficient, was naturally irksome; and 1808 she was tried still further by the death, at Coruña, of her favorite brother Major S., and of Sir John Moore, for whom she is known to have cherished an affection. The precise relations between them have never been made known; but the last words spoken by the dying hero were: 'Stanhope' (a Capt. Stanhope of his staff, who stood by him), 'remember me to your sister.' Conceiving a disgust for society, Lady S. retired into Wales, and 1810 she left England, never to return. In mere restlessness of spirit she wandered for a year or two on the shores of the Mediterranean, and finally settled among the semi-savage tribes of Mt. Lebanon. Here she led the strangest life—adopting in everything the eastern manners, and by her force and fearlessness obtaining marvellous ascendancy over the rude races around her. She was regarded by them with superstitious reverence as a sort of prophetess, and gradually came so to consider herself. With the garb of a Mohammedan chieftain, she adopted something of the faith of one, and her religion, which seems to have been sincere, was compounded in about equal proportions of the Koran and the Bible. Her recklessly profuse liberalities involved her in constant straits for money; and her health also giving way, her last years were passed in wretchedness of various kinds, under which, however, her untamable spirit supported her bravely to the end. She died at her lonely villa of Djoun, 8 m. from Sidon, among her more than a score of oriental servants, but with no Frank or European near; and was buried in her own garden. The main sources of information about her are the notes of the frequent travellers who visited her in her strange seclusion, and the *Memoirs* derived from her own lips, and afterward (3 vols. Lond. 1845–6) published by her physician, who went abroad with her and from time to time dwelt in her household, though he was not with her at her death.

STANHOPE, PHILIP DORMER, fourth Earl of Chesterfield: see CHESTERFIELD, EARL OF.

STANHOPE, PHILIP HENRY, Earl: historian and biographer: 1805–1875, Dec. 24; b. Walmer; only son of the fourth Earl S., representative of a branch of the family of the Stanhopes, earls of Chesterfield, whose founder, a distinguished diplomatist in the reigns of William III. and Queen Anne, was son of the first Earl of Chesterfield. James, first Earl S., was an eminent military commander, who effected the reduction of Port Mahon, in the island of Minorca, and was the favorite minister of George I. His grandson, third earl, distinguished for scientific researches, and inventor of a printing-press which bears his name, died 1816. The subject of this notice, whose courtesy-title was Viscount Mahon, received a private education,

but graduated at Oxford, where he took his B.A. degree 1827; created D.C.L. 1834. He entered the house of commons 1830. He was a moderate conservative in politics, and was warmly attached to Sir R. Peel, who named him one of his literary executors. His contributions to history are numerous and valuable. His most considerable work is *A History of England from the Peace of Utrecht to the Peace of Versailles*, 1713–83, in 7 vols. His other works include a *Life of the Right Hon. W. Pitt*; a *History of Spain under Charles II.*; a *Life of the Great Condé* (written originally in French); a *Life of Belisarius*; *Historical and Critical Essays*; and *Miscellanies*. With the Right Hon. E. Cardwell, he edited the *Memoirs of Sir R. Peel*. He was elected lord rector of the Univ. of Aberdeen 1858.

STANIEL, or STANYEL, n. *stăn'yěl*: in *OE.*, a base or inferior kind of hawk; probably a corruption of *stone-gall*, another name for the same bird. STANIELRY, n. *stăn yěl-rĭ*, ignoble falconry.

STANISLAS, *stăn'is-las* (or STAN'ISLAUS), AUGUSTUS, last King of Poland: see POLAND: PONIATOWSKY, JOSEPH ANTON.

STANISLAWOW, *stăn'is-lá'vōv*, or STANISLAU, *stăn'is-low*: town in the Austrian crown-land of Galicia, pleasantly situated between two branches of the Bistricza, 75 m. s.e. of Lemberg. It is the seat of active trade and manufactures. Pop. (1880) 18,626.

STANK, n. *stăngk* [*OF. estang*—from *L. stagnum*, a pool of standing water: *Gael. stang*, a pool, stagnant water]: in *Scot.*, a pool; a pond; an open sewage conduit.

STANK, v. *stăngk*: pt. of STINK, which see.

STANK, or STANCK, a. *stăngk* [*It. stanco*, fatigued, wearied]: in *OE.*, weak; worn out; weary.

STANLEY, *stăn'lĭ*, ARTHUR PENRHYN, D.D.: an eminent scholar, author, and theologian of the Church of England: 1815, Dec. 13—1881, July 18; b. Alderley (where his father was then rector); son of Edward S., D.D., Bp. of Norwich, and nephew of Baron S. of Alderley; of a branch of the same family with the earls of Derby. Educated at Rugby under the care of Dr. Arnold. he passed (1834) as an exhibitioner to Balliol College, Oxford, where he achieved a brilliant reputation, winning the Ireland scholarship, and taking a first-class in classics (1837), the Latin essay prize (1839), and the English essay and theological prizes (1840). In 1838 he was chosen a fellow of University College, of which he was tutor and examiner for many years. Appointed canon of Canterbury (1851), prof. of ecclesiastical history at Oxford, canon of Christ-Church, and chaplain to the bp. of London (1858), he succeeded Abp. Trench 1864 as Dean of Westminster. He was also chaplain to the queen. In 1874 he was elected rector of St. Andrews Univ. His wife, daughter of the Earl of Elgin, died 1876. In 1862, he accompanied the Prince of Wales to Egypt and the Holy Land.—During his

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professorship at Oxford he sought to mediate between the theological factions, then excited by such opinions as those promulgated in the famous volume of *Essays and Reviews*. His position may be seen in his *Essays on Church and State*; which, however, were offensive to the high church party, who demanded a formal condemnation of the Jowett and Temple *Essays*. He had sought toleration also for Prof. Frederick D. Maurice, and now for Bp. Colenso; and about the same time, 1863, advocated a less strict subscription to the 39 articles. After becoming Dean of Westminster, he showed his liberality by favoring the monument in the abbey to the brothers Wesley, by his invitation to the Bible revisers of every faith to the holy communion, by recommending that ministers of all Christian denominations be admitted to Anglican pulpits, and by urging that the recital of the Athanasian creed be optional. He looked forward to a 'catholic, comprehensive, all-embracing Christianity,' and insisted especially on exaltation of primary and essential doctrine at the expense of technicalities, historic confessions, and ritual. Himself holding firmly to fundamental truths and profoundly reverencing the Bible (exhorting, indeed, to its more diligent study), he found the great miracle of revelation chiefly in its moral and spiritual verities. Meanwhile his zeal was expended not merely in religious directions, but also he cared for the working classes in every grade, from high to low. His congregations increased, his eloquence attracted all, and his frankness and large social gifts made his friends innumerable, though on strict ecclesiastical grounds he had strong opponents. Such was the leading liberal theologian of the Church of England, and his books testify to the fulness of his learning, the freshness and glow of his mind, his literary genius, and his power of word-painting; and his hymns reveal the grace and tenderness of his spirit.—Dean S., through his later years, had been the recognized leader of the 'broad church' company. He was buried in the abbey which he loved so well.—His principal writings, besides his contributions to reviews and to Smith's classical dictionaries, are the *Life of Dr. Arnold* (1844); *Sermons and Essays on the Apostolical Age* (1846); *Memoir of Bishop Stanley* (1850); *The Epistles to the Corinthians* (1854); *Sinai and Palestine* (1855); *The Unity of Evangelical and Apostolical Teaching* (1859); *Lectures on the Eastern Church* (1861); *Lectures on the Jewish Church* (1863-65 and 76); *Sermons Preached before the University of Oxford* (1860-63); *Historical Memorials of Westminster Abbey* (1867); *The Three Irish Churches* (2d ed. 1869); *Essays on Church and State* (1870); *The Athanasian Creed* (1871); *Lectures on the Church of Scotland* (1872); a work on the Utrecht Psalter (1874); *Christian Institutions; Essays on Ecclesiastical Subjects* (1881).

STAN'LEY, DAVID SLOANE: soldier: b. Chester, Wayne co., O., 1828, June 1. He graduated at the U. S. Milit. Acad., and was appointed brev. 2d lieut. 2d U. S. dragoons 1852. In the regular army he was promoted 2d lieut. 1853; 1st lieut. 1st cav. 1855; capt. 4th cav. 1861;

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maj. 5th cav. 1863; col. 22d inf. 1866; and brig.gen. 1884, Mar. 24; and brevetted lieut.col. 1862 for Stone River; col. 1864 for Resaca; and brig.gen. and maj.gen. 1865 for Ruff's Station and Franklin. In the vol. army he was commissioned brig.gen. 1861, Sep. 28; promoted maj.gen. 1862, Nov. 29; and mustered out of the service 1866, Feb. 1. Nearly all of his milit. life has been passed on duty among the Indians, and it is said that he has had dealings with almost all the tribes in the Mississippi and Rio Grande valleys, having served in or had command of departments from N. D. and Mont. to N. Mex. and Texas.

STAN'LEY, The Right Hon. EDWARD HENRY SMITH; the 15th Earl of Derby: eminent English statesman: 1826, July 21—1893, Apr. 21; b. Knowsley Park, Lancashire; eldest son of the fourteenth Earl of Derby (q.v.). He was educated at Rugby; and at Trinity College, Cambridge, where he concluded a distinguished university career by taking a first-class in classics 1848, with a declamation prize and mathematical honors. He early adopted the profession of statesmanship, and applied himself especially to study of social and economical questions. During his absence on a tour in Canada, the United States, and the W. Indies, he was elected (1848, Dec.) M.P. for King's Lynn, on the death of Lord G. Bentinck.* He visited the East, and was still in India when his father received the queen's command to form an administration, in which S. was appointed under-sec. for foreign affairs. In 1858 he was appointed to the secretaryship of the colonies in Lord Derby's administration, and was soon called to succeed the Earl of Ellenborough (q.v.) as pres. of the board of control for the affairs of India. The great Indian mutiny had not yet been quelled, and it devolved on S. to frame resolutions and bring in a bill abolishing the E. India Company (q.v.), and transferring their Indian possessions to the direct government of the crown: this he performed with consummate ability. The great mutiny was put down during his secretaryship, and 1859, Feb., he had to meet the financial disorganization which it bequeathed. The Derby govt. resigned before S. could carry out his plans for the finances of India; but he gave effective support to his successor in measures of administrative improvement. In his father's third administration, formed 1866, July, he was sec. of state for foreign affairs, and gained much popularity by his ability and tact in negotiations for the settlement of the Luxemburg difficulty. He continued in this office till the accession of the Gladstone ministry to power 1868. He was installed lord rector of the Univ. of Glasgow 1869, Apr.; and in Oct., on the death of his father, he took his seat in the house of lords. He was again made foreign sec. by Disraeli 1874; but on account of divergence from the views of the premier on the eastern question, he, like his colleague the Earl of Carnarvon, retired from the ministry early in 1878. He published a manifesto 1880, Mar. 12, announcing his adherence to the policy of the liberal party as to foreign affairs, and detaching himself definitively from the conservative organ-

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ization. He was sec. of state for the colonies in Gladstone's cabinet 1882, Dec.—1885, July; but 1886 joined the unionist defection. He was lord rector of Edinburgh Univ. 1874; at various times he served on important royal commissions—e.g., on Army Purchase, Organization of the Indian Army, Patents, City Guilds, and Market Rights and Tolls.

STANLEY, HENRY MORTON, LL.D., D.C.L. (original name JOHN ROWLANDS): explorer: b. near Denbigh, Wales, 1840. He became an inmate of the poor-house at St. Asaph when three years old, received his first instruction in its school, and was appointed a teacher of small children at Mold, Flintshire, when 13 years old. Two years later he came to the United States as a cabin-boy on a vessel bound for New Orleans; and in that city was befriended by a merchant whose name he assumed. On the death of his friend without making a promised provision for him, S. went to Cal. and worked in the gold mines. In the early part of the civil war he was in the Confederate milit. service, but on being taken prisoner by Union troops he enlisted in the U. S. navy, where he attained the rank of ensign. After the close of the war he became a journalist; and as correspondent of the New York *Herald* wrote letters from Crete and Asia Minor, accompanied the British expedition to Abyssinia 1867, and gained wide fame by sending a full report of Lord Napier's victory over King Theodore to London in advance of the official announcement. In 1868 he was assigned to report on the Carlist war in Spain, and in the following year received a laconic order from the late James Gordon Bennett, proprietor of the *Herald*, to 'find' Dr. David Livingstone, the African missionary and explorer, from whom nothing had been heard for more than two years. S. stopped long enough to report the opening of the Suez canal; then hastened to Zanzibar, where he organized his expedition, with which he started for the interior of Africa 1871, Mar. 21, and succeeded in meeting Livingstone at Ujiji, Nov. 10—an achievement which an expedition equipped by English 'Livingstone Relief Committees' had failed to accomplish. On his arrival in England 1872, July, S. was received with general acclamation; but by his exploration of the lake region of equatorial Africa and of the Lualaba-Congo (see CONGO) 1874–77 he placed himself in the front rank of African travellers. Under a joint commission from the New York *Herald* and the London *Daily Telegraph*, S. started from the e. coast of Africa 1874, circumnavigated the Victoria Nyanza (q.v.), marched across the country to the Albert Nyanza, and then, coming s. again, examined part of Tanganyika and its outlet toward the Lualaba. From Unyanyembe he pushed onward along the course of the Lualaba, supported by a large party of followers; and arriving at the mouth of the Congo 1877, Aug., he proved that the Congo (q.v.) and Lualaba were identical. In 1879 he became a leader of the Belgian International Society's expedition for establishing commercial stations on the Congo (see CONGO, INDEPENDENT STATE OF); which was highly successful.

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In 1887 he commanded an expedition for the relief of Emin Pacha (q.v.), returning to London early in 1890. There the highest honors were paid him, including the conferring of honorary degrees by Edinburgh Univ., Cambridge Univ. (both LL.D.), and Oxford (D.C.L.). He was married to Dorothy Tennant in Westminster Abbey 1890. In 1895 he was elected a member of the House of Commons. He has published: *How I Found Livingstone; Coomassie and Magdala; Through the Dark Continent; The Congo and the Founding of its Free State; In Darkest Africa and Slavery in Africa.*

STANNARY, a. *stăn'nă-ră* [mid. L. *stannāria*, a tin mine—from L. *stannum*, tin]: pertaining to tin mines or works (see TIN): N. a tin mine—term applied usually with reference to the peculiar laws and ancient usages connected with the tin mines in Cornwall and Devon, England. STAN'NATE, n. *-năt*, a salt of stannic acid. STAN'NIC, a. *-nĭk*, pertaining to or procured from tin. STANNIC ACID (see TIN). STANNIFEROUS, a. *stăn-nĭf'ēr-ŭs* [L. *fero*, I produce]: containing or yielding tin. STANNOUS OXIDE, compound of tin and oxygen containing half as much oxygen as stannic oxide. STANNINE, n. *stăn'nĭn*, ore of tin consisting of the sulphides of tin, copper, and iron. STANNARY COURTS, special courts in Cornwall and Devonshire for administration of justice to those connected with the tin mines.

STANNOSO-, prefix, *stăn-nō-so* [mod. L. *stannosus*, full of tin]: pertaining to tin; largely consisting of tin.

STANOVOL, *stâ-nō-voy'*, or STANOWOI KHREBET (Framework Mountains): extensive mountain chain in Siberia, in the extreme n.e. of Asia; the water-shed between the rivers which flow n. into the Arctic Ocean and those tributary to the Amur. The chain extends e.n.e., an estimated length of 3,000 m., from the Transbaikal territory along the shores of the Sea of Okhotsk; separating into several branches, one of which stretches e. to Behring Strait. Of this great range little is known further than that it is elevated and rugged, and that its peaks are covered with perpetual snow.

STANTON, *stăn'ton*, EDWIN McMASTERS: 1814, Dec. 19—1869, Dec. 14; b. Steubenville, O.: war-secretary and lawyer. After two years at Kenyon Coll., he practiced law at Cadiz, O., was prosecuting atty., returned to his native place, moved to Pittsburgh, and afterward to Washington, distinguishing himself in important suits before the U. S. supreme court. In 1860, Dec. 20, he was appointed atty.-gen. under Pres. Buchanan—the very day that S. C. seceded; and, amid the vacillation of the president and his advisers, stood valiantly for the Union, denouncing Sec. Floyd's proposal to give up Fort Sumter as no better than Arnold's treason. In the trying days of 1862, while the long-delayed Peninsular campaign under McClellan was in jeopardy near Richmond, Pres. Lincoln called S. to the secretaryship of war, 1862, June 15, though S. was little known to him personally: energy was needed at the

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war dept., and, at that time, Pres. Lincoln doubtless regarded it as policy to select a war democrat, who, though a 'free-soiler' as far back as 1848, was disposed, like the president, to recognize the constitutional claim of slave property, as had been done in the president's offer of compensation, repeated 1862, May. The requisite energy was exhibited throughout S.'s tenure of office, with untiring industry, ability in rapid dispatch of business, and large comprehension of affairs. While at work, S. was not noted for suavity, and the amount and nature of his work demanded peremptory decision. The gravest charge that can be brought against him was the publicity that he gave immediately and officially to his condemnation of Gen. Sherman's terms of peace with Gen. Johnston, made under a misapprehension of the wishes of the govt., for which misapprehension the govt. was responsible, and after the splendid service of Gen. Sherman in bringing the war to a close. After the accession of Pres. Andrew Johnson, S. sided with the republicans against the president, refused to resign 1867, was restored by the senate when suspended, was again sustained by the senate 1868 against removal; but resigned after the failure of impeachment. He was appointed by Pres. Grant justice of the U. S. supreme court 4 days before his death. He died poor, having never perverted his office to selfish gains. His service to his country in its day of storm and trial, it would be scarcely possible to overestimate.

STANTON, ELIZABETH (CADY): reformer: b. Johnstown, N. Y., 1815, Nov. 12; dau. of Judge Daniel Cady. She studied at the acad. in her native town, became proficient in Greek, Latin, and mathematics, and graduated 1832 from Mrs. Willard's seminary in Troy. With Henry B. S., whom she had just married, she attended the World's Anti-Slavery Convention, London 1840. After living in Boston, she removed 1847 to Seneca Falls, N. Y.; and the following year, July 19-20, the first Woman's Rights Convention was held at her home. The inclusion of the right of suffrage for women in the demands made by this convention was due to her eloquent appeals, seconded by those of Frederick Douglass. She presented to various state legislatures and congressional committees the claims of married women to the protection of their interests, and became a popular lecturer on her favorite theme. In 1866 she was an independent candidate for congress, and two years later became one of the founders and editors of *The Revolution*. For ten years she was pres. of the national committee of the woman suffrage party and of other bodies. She was one of the authors of a *History of Woman's Suffrage*. She died 1902, Oct. 26.

STANTON, HENRY BREWSTER: 1805, June 29—1887, Jan. 14; b. Griswold, Conn.: journalist and reformer. He became a journalist in Rochester, afterward took a partial course of study at Lane Theol. Seminary, soon became prominent in the anti-slavery cause, and was one of the founders of the political party of abolitionists. He married Elizabeth Cady S.; and soon afterward went as dele-

STANWIX—STAPHYLORAPHY.

gate to the World's Anti-Slavery Convention, London, 1840. He studied law, and practiced some years in Boston, removed to Seneca Falls, N. Y., 1847, became state senator, and aided in the formation of the republican party. S. wrote largely for many papers; and for nearly 20 years before his death was one of the editors of the *New York Sun*. He published *Reforms and Reformers in Great Britain and Ireland* (1849), and *Random Recollections* (1886).

STANWIX, *stăn'wîks*, JOHN: 1690–1765: pre-revolutionary soldier: b. England. He entered the Brit. army 1706; was capt. 1739; lieut.col. 1745; mem. of parliament 1750; col. of a royal Amer. regt. 1756, commanding the s. district 1757, and made brig.gen. Subsequently he built Fort Stanwix at the Oneida portage, repaired the fort at Pittsburgh, was made maj.gen. and lieut.gen., and returned to England, where he was lieut.gov. of the Isle of Wight, and mem. of parliament. He was lost in a wreck while crossing St. George's Channel.

STANZA, n. *stăn'ză* [It. *stanza*, a stanza, so named from having a pause in the versification at the close—from L. *stārĕ*, to stand: Sp. *estancia*, stay, a stanza]: in *poetry*, a number of lines or verses regularly connected and adjusted to each other, and usually ending in a full point or pause (see RIME): a part of a poem containing every variation of measure in the poem. STANZAIC, a. *stăn-ză'îk*, consisting of stanzas.

STAPEDIUS, n. *stă-pē'dî-ŭs* [mid. L. *stāpēs*, a stirrup]: in *anat.*, a small muscle hid within the bone of the middle ear, and inserted into the neck of the stapes posteriorly. STAPES, n. *stă'pēz*, a stirrup-like bone of the middle ear, forming the third and innermost bone of the chain of ossicles stretching across the middle ear.

STAPELIA, n. *stă-pē'li-ă* [after Dr. *Stapel* of Amsterdam]: extensive genus of plants having a grotesque appearance, and singularly beautiful star-like flowers, which have usually a very fetid odor, ord. *Asclepiadacēæ*; Carrion-flowers (q.v.).

STAPHYLE'A—STAPHYLEA'CEÆ: see BLADDER-NUT.

STAPHYLOMA, n. *stăf'î-lō'mă* [Gr. *staphylōmă*, a small tumor in the cornea of the eye—from *staph'ŭlē*, a grape]: disease of the eye in which the cornea loses its transparency and forms a pearl-colored projection; any protrusion on the anterior surface of the eye. S. of the iris occurs when there is protrusion of the iris through a perforation of the cornea either by ulceration or by a wound. S. of the cornea occurs when that coat of the eye is more or less destroyed, and when the pressure of the fluids of the eye causes protrusion of the cicatrix on the iris in the form of an opaque white prominence.

STAPHYLORAPHY, n. *stăf'î-lōr'ă-jî* [Gr. *staph'ŭlē*, a grape; *rhaphē*, a seam—from *rhaptō*, I sew] surgical operation for uniting the edges of a divided palate.

STAPLE—STAR.

STAPLE, n. *stā'pl* [AS. *stapul*, a prop: Dut. *stapel*, a staple, a support: Dan. *stabel*, a hinge]: hook or loop of iron; iron loop stuck into a door-post to hold the bolt of the lock.

STAPLE, n. *stā'pl* [Dut. and Sw. *stapel*, a heap, a place where goods are stored up: OF. *estaple*, a public storehouse where foreign merchants lodged their goods]: formerly, a market or emporium, and in England a town to which the chief products were brought for sale, especially for export; thence the merchandise brought to be sold: in modern usage, the principal commodity or productions of a country or district: original material; raw material; main element: the thread or pile of cotton, wool, or flax, as cotton of a long *staple*: **ADJ.** settled; established in commerce. **STA'PLER**, n. *-plēr*, dealer in principal commodities, as a wool-*stapler*. Several articles were anciently enumerated as the staple merchandise of England; of which wool was much the most important.—The Staple towns became invested with important privileges. A tribunal of great antiquity—the Court of Staple—had cognizance of all questions arising between merchants native and foreign: it was composed of 11 members native and foreign, under the Mayor of the Staple elected yearly by all the merchants in attendance. The whole system long ago passed into disuse.

STAR, n. *stār* [Gr. *astēr*; L. *astrum*; Goth. *stairno*; Ger. *stern*; Dut. *ster*; Cornish, *steren*; AS. *steorra*; Dan. *stjarne*, a star]: one of the many twinkling luminous bodies seen in the firmament on a clear night; any luminous body, particularly when it appears in the sky: ornamental figure rayed like a star, e.g., a badge of knighthood: person or thing unusually attractive or brilliant; specially, a distinguished and popular theatrical performer: in *printing*, etc., mark of reference, called also an *asterisk*: in the *plu.*, a configuration of the planets as supposed to affect destiny: **V.** to adorn or stud with stars; to bespangle; in *familiar language*, to appear as an actor in a provincial theatre among inferior players. **STAR'RING**, imp. **STARRED**, pp. *stārd*: **ADJ.** decorated or studded with stars; influenced by the stars with respect to fortune, as *ill-starred*. **STARRY**, a. *stār'ri*, adorned with or resembling stars; abounding with stars. **STAR'RINESS**, n. *-nēs*, the state of being starry. **STAR-LIKE**, resembling a star. **STAR'LESS**, a. *-lēś*, without stars. **STAR-ANISE** (see **ANISE**). **STAR-CHAMBER** (see below). **STAR-FISH**, sea animal of many species, having five arms or limbs branching from a centre like a star (see below). **STAR-GAZER**, *humorously*, an astronomer; one who studies the stars: a fish found in the Mediterranean (see below). **STAR-JELLY** (see **NOSTOC**). **STARLIGHT**, a. lighted by the stars only: **N.** light from the stars. **STARPROOF**, in *OE.*, impervious to starlight. **STAR-REDE**, *-rēd* [AS. *ræd*, counsel]: in *OE.*, knowledge of the stars; astrology. **STAR-STONE**, a stone having a radiated texture; a variety of sapphire which, when cut in a certain way, reflects the light in a star-like form. **STAR-SPANGLED**, a. studded with stars. **STARWORT**, the Michaelmas daisy, *Aster Tripolium*, ord.

STAR—STARBOARD.

Compositæ (see MICHAELMAS DAISIES: ASTER). STAR-PAVED, a. studded with stars. STAR-THISTLE (see CENTAURIA). FALLING or SHOOTING STAR, a luminous meteor seen shooting athwart the sky, often in great numbers. FIXED STARS, *stars* as distinguished from the *planets*, the former so called because they constantly maintain the same, or nearly the same, relative positions in the heavens (see STARS). STAR IN THE ASCENDANT, said of a person while very fortunate and prosperous, a phrase taken from the language of astrology.

STAR, in Heraldry: frequent heraldic bearing; representing sometimes the heavenly body so called, sometimes the rowel of a spur. In the latter case, it is blazoned a *Mullet* (q.v.). Stars of more than five points should have the number of points designated, and the points may be wavy. A S., or *estoile*, with wavy points, is often designated a blazing star; and when the points are more than six in number, it is usual to represent only every second point as waved.—The S. is a well-known ensign of knightly rank: a S. of some specified form constitutes part of the insignia of every order of knighthood.

STAR, ORDER OF THE: formerly an order of knighthood in France, founded by John II. 1350, in imitation of the order of the Garter in England. The ceremony of installation was originally performed on the festival of the Epiphany, and the name of the order is supposed to have been allusive to the Star of the Magi.

STARAIJA-RUSSA, *stâ-rî-â-rôs'sâ*: town of Russia, govt. of Novgorod, 184 m. s.e. of St. Petersburg. It has 16 churches. S. is remarkable for its salt springs, which attract many visitors in summer. Communication with St. Petersburg by the Moscow railway and the river Volkhov, is easy and rapid. Pop. (1885) 13,537.

STAR APPLE (*Chrysophyllum*): genus of trees and shrubs of nat. order *Sapotaceæ*. The species are natives of tropical and subtropical countries. The S. A. of the W. Indies (*C. Cainito*) is a shrub eight or ten ft. high. The fruit—which when cut across presents a star-like figure—is large, rose-colored, mixed with green and yellow; and has a soft sweet pulp of agreeable flavor. Other species produce edible fruit.

STARBOARD, n. *stâr'bôrd* [Dan. *styrbord*; Icel. *stjorn-bordi*, the starboard—from Icel. *stjorn*, steerage, and *bord*, a board, side of a ship: Dan. *styre*, to steer—so called from the rudder consisting of an oar on the right side of the ship where the steersman stood]: the right-hand side of a ship looking toward the head or stem—the left side was called formerly *Larboard* (q.v.), now *Port* (q.v.): ADJ. lying on the right side of a ship. STAR-BOW'-LINES, n. plu. *-bô' lînz*, the men or mess in the starboard watch. *Note*.—To prevent fatal errors from similarity of sound, *larboard* is now called *port*. STARBOARD THE HELM, turn the helm to the right. PORT THE HELM, turn the helm to the left.

STARCH.

STARCH, n. *stárch* [Ger. *stärke*, strength, stiffness: Sw *starkelse*, starch: Gael. *stalcadh*, starching—from *stalc*, starch (see also **STARK**)]: white farinaceous substance obtained from grain, potatoes, and other vegetables, used in the form of a jelly for stiffening articles of dress, etc.: V. to stiffen with starch. **STARCH'ING**, imp. **STARCHED**, pp. *stárch't*: **ADJ.** stiffened with starch; precise; stiff. **STARCH'ER**, n. *-ér*, one who starches. **STARCH'Y**, a. *-y*, of or like starch. **STARCH-LIKE**, a. resembling starch. **STARCH'EDLY**, ad. *-éd-ly*. **STARCH'EDNESS**, n. *-nès*, stiffness in manners; formality.—*Starch*, or Amylaceous Matter ($C_6H_{10}O_5$), is an organized substance of the class known as carbohydrates, which occurs in roundish or oval grains in the cellular tissue of certain parts of plants. It is very widely diffused through the vegetable kingdom, and is abundant especially in the seeds of the cereals, in the seeds of leguminous plants such as peas and beans, in the tuber of the



Starch Granules in
Potato.

potato, in the roots of arrowroot and tapioca, in the pith of the sago palm, etc. The grains of S. from the same kind of plant are moderately uniform in size and shape, but vary in different species of plants from $\frac{1}{200}$ to less than $\frac{1}{3000}$ of an inch in diameter; and while some are circular or oval, others are angular: moreover, among other differences, some (chiefly the larger grains) exhibit a series of concentric rings, while in others no rings are apparent; and while the grains of potato-S., if illuminated by polarized light, with a Nicol's prism placed between the object and the eye, present a

well-marked black cross, in wheat-S. no such cross is perceptible.

Ordinary commercial S. occurs either as a white glistening powder, or in masses which are readily pulverized; and when pressed between the fingers it evolves a slight but peculiar sound. It is heavier than water, and is insoluble in cold water, alcohol, and ether. If, however, it be placed in water at a temperature of 150° F., its granules swell from absorption of fluid, and the mixture assumes a viscid, pasty consistence. Dilute acids rapidly induce a similar change, even without the agency of heat; and if heated with dilute sulphuric acid, the S. is converted first into dextrine, and finally into glucose or grape-sugar: and manufacturing chemists avail themselves of this property to obtain glucose on a large scale. S. dissolves in cold nitric acid; and on the addition of water to this solution, a white, tasteless, insoluble precipitate falls, known as *Xyloidin*, which explodes violently when struck by a hammer; and when heated to 350° F. bursts into flame, leaving a carbonaceous residue: the composition of xyloidin is represented by the formula $C_6H_9NO_7$.

The reactions of S. with iodine and bromine are very remarkable. Iodine communicates to it a brilliant blue color; hence S.-paste serves as a delicate test for free

STARCH.

iodine. This coloration appears not to depend on a chemical combination, because on application of heat the color disappears, and reappears on cooling. Bromine communicates a brilliant orange tint to S.—a reaction by which the presence of free bromine may be readily detected. When heated to a temperature of 340° to 400° F., dry S. is converted into Dextrine (q.v.), or British gum. At higher temperature, it undergoes decomposition, and yields on dry distillation the same products as sugar. When heated in steam under pressure, it also passes into dextrine, and finally into glucose. The addition of a little sulphuric acid hastens these changes.

During germination of seed, the S. in the seed undergoes a kind of fermentation, and is converted into a mixture of dextrine and glucose: this change is due to the action of a peculiar ferment, Diastase (q.v.), which exists in all germinating seeds during the process of growth. Various animal matters, e.g., saliva, pancreatic juice, the serum of the blood, bile, etc., exert on S. the same action as diastase. By treating S. with chlorine, a remarkable, colorless, oily fluid, *Chloral* (q.v.) is obtained. By prolonged exposure to the air, S. paste becomes acid, in consequence of the formation of lactic acid.

S. is obtained usually by a simply mechanical separation of it from the ingredients with which it is associated; advantage being taken of its insolubility in cold water. The details of the mode of separation vary according to the source whence it is procured. Miller's *Organic Chemistry* (pp. 100,101) gives the following method of procuring *potato-starch*: This variety is prepared on a large scale from potatoes, which contain about 20 per cent. of amylaceous matter. The cellular tissue of the tuber does not exceed 2 per cent. of the mass; while of the remainder about 76 per cent. consists of water, and the rest of small quantities of sugar, salts, and azotized matters. To exact the S., the tubers, first freed from adhering earth by thorough washing, are rasped by machinery. The pulp thus obtained is received upon a sieve, and is washed continuously by a gentle stream of water so long as the washings run through milky. This milkiness is due to the granules of S. held in suspension. The milky liquid is received into vats, in which the amylaceous matter is allowed to subside; the supernatant water is drawn off, and the deposit is repeatedly washed with fresh water until the washings are no longer colored. The S. is then suspended in a small portion of water, run through a fine sieve to keep back any portions of sand, and after having been again allowed to settle, is drained in baskets lined with ticking; the mass is then placed upon a porous floor of half-baked tiles, and dried in a current of air, at first of the natural temperature; the drying is completed by application of moderate artificial heat.—To obtain S. from wheat or rice, a more complicated process is required, as the large quantity of gluten associated with the S. in these grains must be removed either by fermentation, or by a weak alkaline solution, which dissolves the gluten, but

STARCH.

does not affect the S. granules. The manufacture of S. from maize (Indian corn) by an alkaline process dates from 1842, when it was introduced by Thomas Kingsford, whose S. factory in Oswego, N. Y., is now and long has been perhaps the most extensive establishment of the kind in the world. The alkaline process itself was invented by Orlando Jones, and patented 1840, for producing S. from rice. The method of treating the raw material varies in some respects according to the sort of grain employed, whether rice or maize, etc.; but the principle is essentially the same. In Jones's process for manufacturing rice S., the rice is first steeped in an alkaline solution containing about 200 grains of caustic soda or potash to the gallon: for each 2 lbs. weight of rice a gallon of solution is allowed. After 24 hours the liquid is drawn off, the rice is washed and ground fine, then steeped in alkaline solution again, with frequent stirring, for 24 hours: it is then allowed to stand for 70 hours, when the gluten is found floating at the top of the liquid. This gluten is drawn off, purified, and utilized, or it is used crude for feeding animals: the fibrous portion of the grain remains at the bottom, mingled with S. The deposit is now stirred, washed in abundance of water, and the mixture allowed to stand. The fibrous portion then settles at the bottom, while the liquid containing the S. in solution is further purified, allowed to settle, collected, dried, and then enters commerce. S. from maize is manufactured in three different qualities or forms; viz., 'corn S.' for food, 'laundry S.,' and 'manufacturer's S.' for use in cotton-print works.

The importance of S. is obvious when we consider that it may be regarded as the starting-point in the preparation of brandy and other forms of spirit, also of beer and porter; and that it enters largely into the great *saccharine* group, constituting one of the leading subdivisions of food: see DIGESTION. It is, moreover, largely used in laundry work, also in manufacture of dextrine and grape-sugar.

Physiological and Medical Relations.—It might be inferred *a priori* that S. is an essential article of diet, from its abundance in edible vegetables, even were not the fact established by numerous physiological experiments. Thus, various kinds of potatoes yield 12 to 27 per cent. of S.; peas, 32½ per cent.; beans, 34 to 36 per cent.; wheaten bread, 53½ per cent.; wheaten flour, 56½ to 72 per cent.; oatmeal, 59 per cent.; ryemeal, 61 per cent.; barley-meal, 67 per cent.; Indian corn, 81 per cent.; rice, 83 to 85 per cent.; and it occurs in even larger proportions in arrow-root, sago, and tapioca. The diet proper for a state of health consists in due admixture of the albuminous, saccharine (or starchy), oleaginous, and saline groups; but in certain forms of disease, an excess or a diminution of the starchy element is expedient. Thus, in cases of weak gastric digestion, it is not advisable to mix starchy food with the albuminous, as it soaks up the too scanty gastric juice without making any use of it. In such cases, moreover, articles of food like potatoes, new bread, pastry, etc., are apt to turn acid in the stomach, and check digestion.

STAR CHAMBER.

There are, on the other hand, cases of gastric disorder in which a purely starchy diet is expedient. Thus, according to Dr. Chambers, it is the best form of food 'during acute catarrhal bilious attacks at the commencement of treatment, in even chronic gastric cases, and whenever a dusky complexion, hypochondriasis, or general distress show that arrested moulting has caused a collection in the body of effete tissues' (*Dietetics in Clinical Lectures*, 4th ed., 539). In early stages of rheumatic fever and other acute diseases, it is usually expedient to limit the diet of the patient for a day or two to a purely starchy diet, e.g., arrowroot, tapioca, panado, etc. In returning from a purely starchy to a mixed diet, Dr. Chambers suggests that such an arrangement shall be adopted as to prevent starchy and albuminous foods from being together in the stomach, e.g., let the morning and evening diet be vegetable, with a mid-day meal of purely animal food. It should be recollected that though S. is converted into sugar by the saliva, pancreatic fluid, and intestinal juice (see DIGESTION), the change takes place principally from the action of the last-named two fluids in the small intestine. Hence, when the duodenum, jejunum, or ileum are morbidly affected, as in typhoid or enteric fever, in enteritis, in diarrhea, etc., little or no S. should be given in the food.—See DIET: FOOD AND DRINK.

Wheat-starch, the only S. admitted into the Pharmacopœia, is employed in medicine in the form chiefly of mucilage (prepared by triturating 120 grains of S. with 10 fluid ounces of distilled water gradually added, and boiling for a few minutes, constantly stirring). This preparation is used either alone or as a vehicle for more active agents, as an enema, in dysentery, diarrhea, flatulent distention of the bowels, etc.; externally, it is used as an application to excoriations, to prevent bed-sores, etc., and as a basis for dusting-powders in various forms of discharging skin-diseases. For its use in surgery for construction of immovable bandages, see SPLINTS.

STAR-CHAMBER: tribunal of considerable note in Eng. history, which met in the old Council-chamber of the palace of Westminster, and is said to have its name from the gilt stars which were the decoration of the ceiling. It is supposed to have originated in early times out of the exercise of jurisdiction by the king's council, acting as the *concilium ordinarium* and not *privatum*. The powers of the council, however, had been abridged by several acts of Edward III., and had altogether greatly declined when act 3 Henry VII. c. 1, either revived and remodelled them, or instituted, according to the view taken by Hallam, an entirely new tribunal. This statute conferred on the chancellor, the treasurer, and the keeper of the privy seal, with the assistance of a bishop and a temporal lord of the council, and chief-justices, or two other justices in their absence, a jurisdiction to punish, without a jury, the misdemeanors of sheriffs and juries, as well as riots and unlawful assemblies. Act 21 Henry VIII. c. 20 added to the other members of the court the

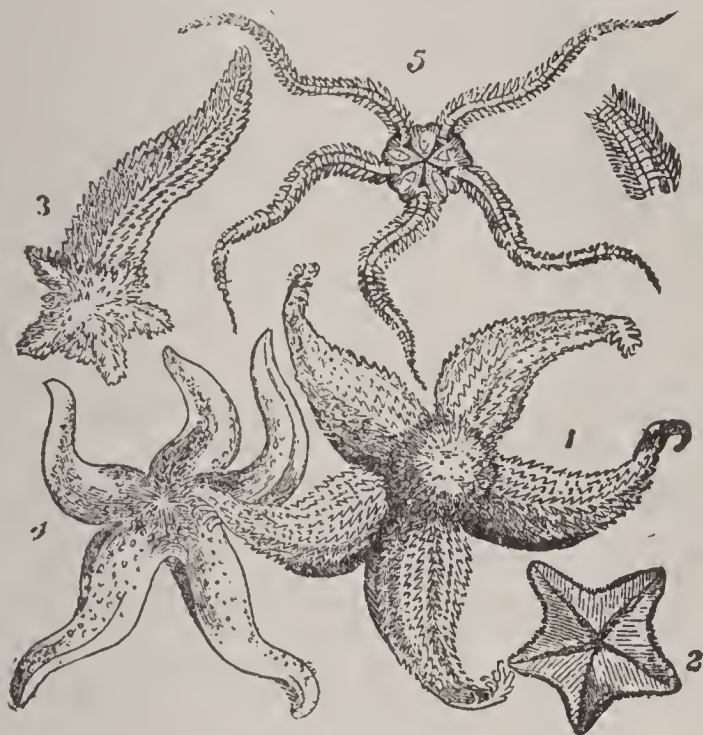
pres. of the council. Whether or not the above-cited act of Henry VII. meant to constitute a court distinct from the council, it is certain that, by the time of Elizabeth, the two jurisdictions were merged in one; and the resulting tribunal was, during the Tudor age, of undoubted utility, in bringing to justice great and powerful offenders who would otherwise have been able to defy the law. The civil jurisdiction of the S.-C. at that period comprised controversies between English and foreign merchants, testamentary causes, disputes between the heads and commonalty of corporations lay and ecclesiastical, and claims to deodands. As a criminal court, it could inflict any punishment short of death, and had cognizance of forgery, perjury, riots, maintenance, fraud, libels, conspiracy, misconduct of judges and others connected with administration of law, and all offenses against the state, so far as they could be brought under the denomination of contempts of the king's authority. Even treason, murder, and felony could be brought under the jurisdiction of the S.-C., where the king chose to remit the capital sentence. The form of proceeding was by written information and interrogatories, except when the accused person confessed, in which case the information and proceedings were oral; and out of this exception grew one of the most flagrant abuses of this tribunal in its later history. Regardless of the existing rule, that the confession must be free and unconstrained, pressure of every kind, including torture, was used to procure acknowledgements of guilt; admissions of insignificant facts were construed into confessions; and fine, imprisonment, and mutilation inflicted on a mere oral proceeding, without hearing the accused, by a court consisting of the immediate representatives of prerogative. This court, acting without a jury, could proceed on mere rumor: moreover both its constituency and the range of its jurisdiction had become utterly indefinite and vague. The proceedings of the S.-C. had always been viewed with distrust by the commons; but during the reign of Charles I. its excesses reached a height that made it absolutely odious to the country at large; and in the last parliament of that sovereign, a bill was carried in both houses (16 Car. I. c. 10), which decreed its abolition.

STARE, *v. stār* [Icel. *stara*; Sw. *stirra*; Dan. *stirre*, to look fixedly; Norw. *star*, eyes, sight; Ger. *starr*, stiff, rigid]: to look fixedly with wide-open eyes; to gaze; to fix an earnest look on an object: N. a fixed look with eyes wide open. STAR'ING, *imp.*: ADJ. gazing with a stare; sticking out. STARED, *pp. stārd*. STAR'ER, *n. -er*, one who stares. STAR'INGLY, *ad. -ing-ly*. TO STARE IN THE FACE, to be plainly before the eyes.

STAR'-FISH (*Asteriadae*): family of *Echinodermata* (q.v.), having in the centre of the body a stomach with only one aperture, but extending by two much-branched cæca, into each of the rays into which the body is divided. In some, the central disk extends to include the rays, so that the general form is angular or lobed; in others, the disk is very small in comparison with the length of the

STAR-FISH.

rays. Locomotion is effected by very numerous Ambulacra (q.v.) in rows on the under side of the rays. A bony framework, of a vast number of pieces, extends to the extremity of each ray. The nervous system has its centre around the mouth and sends a filament to each ray. Star-fishes are hermaphrodite, and produce vast numbers of eggs, which are retained for a time under the body of the parent, resting on the points of its rays at the bottom of the sea, and raising up the centre of the body, in order as it were to hatch them. The young are destitute of rays, and very unlike the mature form, so that their real nature was long mistaken. The mouth of star-fishes being on the under side, they seek their food—as indeed they perform all their motions—by crawling at the bottom of the sea, or on rocks, etc. They are very voracious, and are trouble-



Star-fishes.

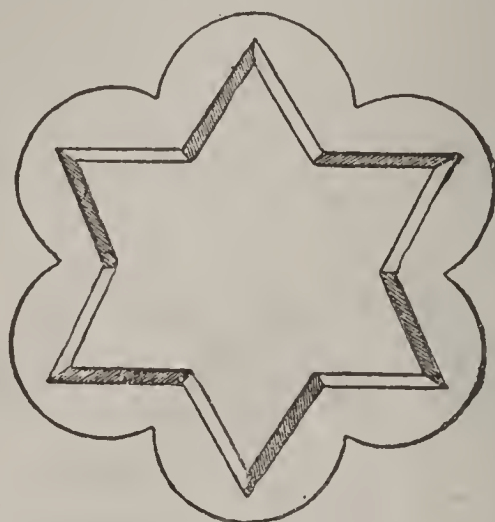
- 1, Common Cross-fish (*Uraster rubens*); 2, Gibbous Starlet (*Asterina gibbosa*); 3, Common Cross-fish, reproducing rays; 4, Eyed Cribella (*Cribella oculata*); 5, Lesser Sand-star (*Ophiura albida*).
— From Forbes's *British Star-fishes*.

some to fishermen by devouring their bait. They possess, in very high degree, the power of reproducing lost members; a disk with a single ray left will reproduce the other rays, and become a perfect star-fish. More extraordinary is the readiness which many of them display, particularly those with long and slender rays, in breaking off these members. Some species—BRITTLE STARS—can scarcely be procured for a museum in an approximately perfect state, because they throw off ray after ray, and, in fact, break themselves to pieces on any alarm. Star-fishes abound in the seas of all parts of the world. The COMMON S., CROSS-FISH, or FIVE FINGERS (*Asterias* or *Uraster rubens*) is plentifully cast up on the beach by the tide, or thrown out of fishing-boats in harbors. Some of the species

STAR-FORT—STARK.

are much larger; and some exhibit very beautiful colors; while others are interesting from their structure—the long serpent-like form of their rays, or the division of the rays by successive forkings, so that the whole creature is a globular mass, whose surface is formed of a countless multitude of living tendrils.

STAR'-FORT, in Field Fortification: strong work consisting of alternate salient and re-entering angles, arranged on a regular or irregular polygon. It is a common defense



Star-fort.

for an eminence on a battle-field, or at the wing of a line, or as protection for reserve-stores of an army.

STARGARD, *stâr'gârt* (Slav. *Starograd* or *Starigrod*, i.e., Old Town): town of Germany, province of Pomerania, on the navigable river Ihna, 23 m. e.s.e. of Stettin, with which, as with Posen and the whole of e. Prussia, it is connected by railway. S. was formerly cap. of Lower Pomerania. It has various but not very important manufactures. S. was raised to the rank of a town 1129. Pop. 21,816.

STAR-GAZER, *stâr'gâz-ér*: percoid fish of genus *Uranoscopus* [Gr. *ouranos*, heaven; *skopeō*, I explore]. Both eyes are on the upper side of the head, which is of nearly cubical form; the mouth, cleft vertically, is also directed upward. All this agrees with the habits of the fish, which buries itself in a muddy bottom, protruding its head, and thus awaiting prey. The eyes, moreover, are singularly protrusive and retractile. Some of the fish have a worm-like appendage of the mouth, to angle for prey. The species are mostly E. Indian. *U. scaber* of the Mediterranean is 1 ft. long. *U. anoplos* of S. C. is 2 in. only, and, as the name indicates, is unarmed with the spines which render some species dangerous to handle.

STARK, a. *stârk* [Icel. *sterkr*; Dan. *stærk*; Sw. and Ger. *stark*, rigid, stiff: Icel. *storkna*, to congeal, to stiffen (see **STARCH**)]: stiff; strong; gross; mere; downright; stiff in death: AD. wholly; entirely. **STARK'LY**, ad. *-lī*, in *OE.*, in a stark manner; stiffly; strongly.

STARK—STARLING.

STARK, JOHN: 1723, Aug. 28—1822, May 8; b. Londonderry, N. H.: revolutionary hero. His father emigrated from Ireland to the wilds of Dunbarton, near the present Manchester, N. H., and young S. grew up an expert hunter. Captured by Indians, he surprised them by returning blows when running the gauntlet, and was honored by them with adoption. He distinguished himself as capt. of rangers in the French war, at Lake George, and was in service till the end of the war. At the opening of the revolution, he hastened to Cambridge with recruits, was made col., and raised a regt. of frontiersmen from the many who followed him, and repeatedly drove back the enemy in his front at Bunker Hill. After the evacuation of Boston, he was in the Canada expedition, and, later, led in the attack at Trenton; also had part in the battle of Princeton. Regarding himself as slighted in promotions, he retired to his farm, but was called by his state to the command of its troops. Acting thus independently, he disobeyed Gen. Lincoln's orders, and consulting his own better judgment, defeated Col. Baum and his force of 1,000 at the famous battle of Bennington, killing 200 and capturing 600 men. This was the first step to Burgoyne's disasters; and congress, which had just censured S.'s disobedience, now made him brig.gen. Recruiting new volunteers, he contributed largely to the surrender of Burgoyne by preventing his retreat. He commanded the n. dept. 1778; was on duty in R. I. and N. J. 1779-80; was on the André court-martial; and again was appointed to the n. dept. After the war he led a retired life. Some of his sayings, such as a direction how to fire at Bunker Hill, and that the enemy must be beaten at Bennington or Molly Stark would be a widow, became familiar proverbs. An obelisk perpetuates his memory at Manchester, N. H.; and one 301 ft. high, dedicated 1891, commemorates the Battle of Bennington (q.v.).

STARLING, n. *stâr'ling* [perhaps Ger. *starr*, stiff; *starren*, to stiffen]: one of the large piles driven down outside the foundation of a pier of a bridge to break the force of the water.

STARLING, n. *stâr'ling*, also called **STARE**, *stâr* [A.S. *stær*; Icel. *starri*; Ger. *staar*; L. *sturnus*, a starling], (*Sturnus*): Linnæan genus of birds, of order *Insessores*; now the family *Sturnidæ*; nearly allied to *Corvidæ*, but in general of smaller size; bill more slender and compressed, with point nail-like; wings long and pointed. They are natives of almost all parts of the world, very generally gregarious, and some of them migratory. They feed on worms, insects, larvæ, and fruits. Some follow herds of quadrupeds, to feed on the insects which attend them. The **COMMON S.** (*Sturnus vulgaris*) is a beautiful bird, rather smaller than the song-thrush or mavis; brown, finely glossed with black, with pale tip to each feather, giving the bird a fine speckled appearance, particularly on the breast and shoulders; in advanced age it is more uniform in color. The plumage of the female is less beautiful than that of the male. Both sexes are more speckled in winter

STAR-NOSE—STAR OF BETHLEHEM.

than in summer. The S. is abundant in Britain, and nowhere more so than in the Hebrides and Orkneys; it is very plentiful in the fenny districts. It is found in all parts of Europe, and throughout great part of Africa; and is common in n. Asia. Starlings make artless nests of slender twigs, roots, and dry grass, in hollow trees, in holes of cliffs, under eaves of houses, or in boxes, often placed for them in trees or elsewhere near houses. They frequently breed twice in a season, and in autumn they unite in large flocks. The S. becomes very pert and familiar in confinement, displays great imitative powers, and learns to whistle tunes, and even to articulate words with great distinctness. Its natural song is soft and sweet. See GRACKLE.—For the AMERICAN STARLINGS, formerly included under the genus *Sturnus*, a separate family, *Icteridæ*, has been made, representing the *Sturnidæ* of the old world, and intermediate between finches and crows. It comprises the bobolink, orioles, and blackbirds. The name American S. is sometimes applied especially to our Meadow or Field Lark (*Sturnella magna*), the underparts conspicuously bright yellow, with a large black crescent separating the throat from the lower breast. Its few notes are very sweet. In the south it is much used for food, like other birds that abound there in winter, though this species is imperfectly migratory. It abounds in all the e. states, replaced in the w. by a variety, *Neglecta*, of paler color, with distinct bars on the wing and tail feathers. In S. America there is a similar species, with red instead of the yellow.—The name S. is curiously applied to a rock-trout (*Hexagrammus Stelleri*) in the Straits of Fuca.

STAR-NOSE, *stâr' nōz* (*Condylura*, or *Astromyctes*, genus of the Mole (q.v.) family, *Talpidae*, having much general resemblance to moles, but with longer tail, and elongated slender muzzle, which bears at its extremity a remarkable structure of fleshy and somewhat cartilaginous rays disposed in star-like form. The habits are similar to those of moles. All the species are natives of N. America. The best known is *Condylura cristata*, which inhabits the eastern United States and Canada.

STARODOUB, *stâ-rō-dób'*: town of European Russia, govt. of Tchernigov; 100 m. n.e. of the town of Tchernigov. It is in a fertile district, but distant from any commercial route. Pop. (1880) 16,820.

STAR OF BETH'LEHEM (*Ornithogalum*): genus of bulbous-rooted plants of nat. order *Liliaceæ*, nearly allied to Squills and Hyacinths. The species are numerous, natives almost exclusively of the e. hemisphere, many of them of the Cape of Good Hope, and some of s. Europe. The Common Star of Bethlehem (*O. umbellatum*), native of France, Switzerland, Germany, the Levant, etc., is very common in flower-gardens. Its flowers are large, six to nine, in a corymbose raceme, white and somewhat fragrant. *Gagea lutea*, formerly *O. luteum*, has yellow flowers.

STAR OF INDIA—STARS.

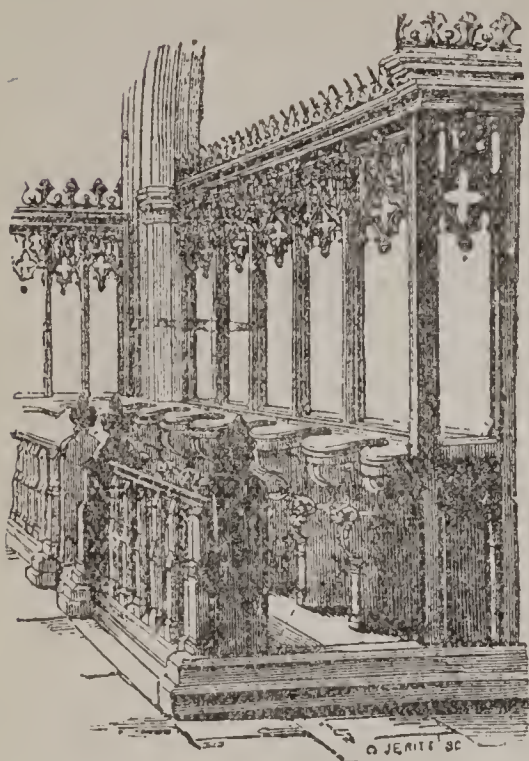
STAR OF IN'DIA, THE MOST EXALTED THE ORDER OF THE: order of knighthood instituted by Queen Victoria 1861, June, with the view of commemorating the formal assumption by the Brit. sovereign of the direct government of India; and of affording the princes, chiefs, and people of the Indian empire a testimony of regard in the bestowment of the decoration in honor of merit and loyalty. The order consists of the sovereign, a grand-master, who is to be the gov-gen. of India for the time being, and 25 knights, with such extra and honorary knights as the crown may appoint. The members are to be military, naval, and civil officers who have rendered important service to the Indian empire, and such native chiefs and princes of India as have entitled themselves to the sovereign's favor. The insignia consist of a collar, badge, and star—with the motto 'Heaven's light our guide.'

STARRED, STARRY, STARRINESS: see under **STAR**.

STARS: luminous bodies in the heavens, distinguished from planets by remaining apparently immovable with respect to one another, hence early called fixed stars—which name they retain, though their perfect fixity has been completely disproved in numerous cases, and is no longer believed in regard to any. Twinkling, or Scintillation (q.v.), is another mark which distinguishes stars from planets.

Among the facts first noticed by the observer of the stars is their apparent daily motion. Most of them appear to rise in the e., describe smaller or greater arcs in the heavens, and set in the w.; while others describe complete circles round a point n. of the zenith, that described by the so-called polar star being the smallest visible to the naked eye (see **CIRCUMPOLAR STARS**). These apparent motions are due to the rotation of the earth on its axis. Had the earth only this rotatory motion, the aspect of the starry heavens at any spot on the earth's surface would be the same at the same hour of the night all the year round; which is not the fact. In consequence of the earth's motion round the sun, or the apparent advance of the sun among the stars, the aspect of the heavens at a particular hour is always changing. The same position of the stars recurs four minutes earlier each night, and at the same time not till the lapse of a year.

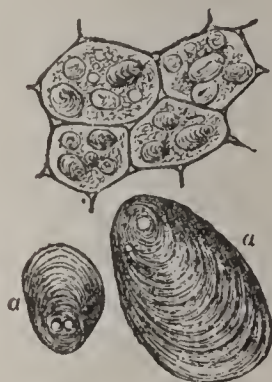
With few exceptions, the *distance* of the fixed stars is still unknown, and must in all be enormously great. Since the time of Bradley, many attempts have been made to measure what is called the *yearly parallax* of the stars, and thus determine their distances (see **PARALLAX**). When we consider that the motion of the earth round the sun brings us at one time a whole diameter of its orbit (nearly 185 millions of miles) nearer to a particular region of the heavens than we were six months before, we should expect a change in the relative distances of the stars as seen from the two points—that as we approach them they should seem to separate. But no such change is seen; and this was one of the early objections to the theory of Coper-



Stalls, Higham Ferrers Church,
Northamptonshire.



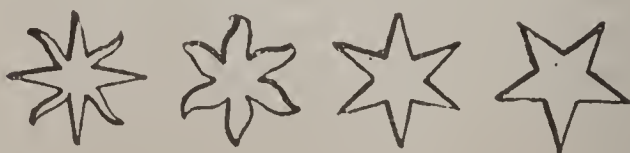
Roman Standards.



Starch Granules in Potato.



Standing Stones of Stennis.



Stars.

STARS.

nicus. The only answer that the Copernicans could give was, that the distance of the stars from us is so great that the diameter of the earth's orbit is as a point compared with it. The detection of the parallax of the fixed stars depended on the perfection of instruments. The parallax of a star is the minute angle contained by two lines drawn from it, one to the sun, the other to the earth. If that angle amounted to a second, the distance of the star would be 206,000 times that of the sun; and when the measurement of angles came to be trustworthy to a second, and still no parallax was discernible, astronomers could say that the distance of the nearest stars must be more than 206,000 times that of the sun—i.e., 206,000 times 92 millions of miles, or about 20 billions of miles. It is only since between 1832 and 38 that any approach to positive determinations of parallax has been made, chiefly by Henderson, Bessel, and Peters. The first published (1838, Dec.) was that of the double star 61 in the constellation of the Swan, by Bessel, who made the parallax $0''.37$, giving a distance more than 550,000 times that of the sun, or 52 billions of miles, so that the light of this star is about $8\frac{2}{7}$ years in reaching the earth. The nearest of all the stars yet measured is α *Centauri*, the finest double star in the southern heavens, whose parallax was determined by Henderson and Maclear at the Cape of Good Hope to be $0''.9128$ (the observations were made in 1832–3; the result read before the Astronomical Soc. of England, 1839, Jan.); or as subsequently corrected, $0''.9187$, corresponding to a distance of about 20 billions of miles, and requiring $3\frac{1}{2}$ years for its light to reach us. To Sirius, the brightest of the stars, a parallax of $0''.15$ has been assigned, implying a distance six times that of α *Centauri*. 'It has been considered probable, from recondite investigations, that the average distance of a star of the *first* magnitude from the earth is 986,000 radii of our annual orbit, a distance which light would require $15\frac{1}{2}$ years to traverse; and further, that the average distance of a star of the *sixth* magnitude (the smallest distinctly seen without a telescope) is 7,600,000 times the same unit—to traverse which, light, with its prodigious velocity, would occupy more than 120 years. If, then, the distances of the majority of stars visible to the naked eye are so enormously great, how are we to estimate our distance from those minute points of light discernible only in powerful telescopes? The conclusion is forced upon us that we do not see them as they appeared within a few years, or even during the lifetime of man, but with the rays which proceeded from them several thousands of years ago!'—Hind's *Astronomy* (see LIGHT-YEAR.)

The stars have from the earliest times been divided into groups called Constellations (q.v.). The several stars belonging to the same constellation are distinguished from one another by Greek letters, beginning the alphabet with the brightest; and when these are not sufficient, by Roman letters and by numbers. Many of the most brilliant stars have special names. They are divided also according to their brightness into stars of the first, second, third, etc.,

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magnitudes—a division necessarily somewhat arbitrary. The smallest stars discernible by a naked eye of ordinary power are usually called stars of the fifth magnitude; but an unusually sharp eye can discern those of the sixth and even seventh magnitude. All smaller are *telescopic* stars, which are divided in a very undetermined way as far as to the twentieth magnitude. Sir J. Herschel has determined that the light of Sirius, the brightest of all the stars, is 324 times that of a mean star of the sixth magnitude. By processes of photometric observation and reasoning, it is concluded that the intrinsic splendor of α Centauri is more than twice that of our sun, and that of Sirius 394 times. Among stars of the first magnitude in the n. hemisphere are usually reckoned Aldebaran (in Taurus), Arcturus (in Bootes), Atair (in Aquila), Betelgeux (in Orion), Capella (in Auriga), Procyon (in Canis Minor), Regulus (in Leo), Vega (in Lyra). In the s. hemisphere are Achernes (in Eridanus), Antares (in Scorpio), Canopus (in Argo), Rigel (in Orion), Sirius (in Canis Major), Spica (in Virgo), and α Centauri and α Crucis that have no special names.

No apparent magnitude, in the proper sense of the word, has yet been observed in any star. In the best and most powerfully magnifying telescopes, even the brightest stars of the first magnitude appear, not with small disks as all the planets do, but as luminous points without any visible diameter, and always the smaller the better the telescope. We are therefore totally ignorant of the real size of the fixed stars; nor could it be determined though we were sure of their distances, for the apparent diameter is an essential element in the calculation. We cannot, then, say whether the greater brilliancy of one star, when compared with another, arises from its greater nearness, its greater size, or the greater intensity of its light. It is certain that all the fixed stars are self-luminous. By the spectroscope several facts regarding their physical constitution have been revealed; there are great differences in their spectra; the existence of several known elements is considered demonstrated. Aldebaran, e.g., contains hydrogen, sodium, magnesium, iron, tellurium, antimony, calcium, bismuth, and mercury: similar results have been obtained by spectroscopic examination of Sirius, the stars of Ursa Major, and many others.

The *number* of the stars is beyond determination. Those visible by the naked eye amount only to a few thousands. Stars of the first magnitude are usually reckoned at 15–20, of the second 50–60, of the third about 200, of the fourth 400–500, of the fifth 1100–1200. But in the subsequent classes, the numbers increase rapidly, so that stars of the sixth and seventh class amount to more than 12,000. Stars are most dense in that region of the heavens called the Milky Way, which is mostly composed of stars of the eleventh and twelfth magnitudes. W. Herschel observed 116,000 stars pass the field of his telescope in a quarter of an hour, while directed to the densest part of the Milky Way.

That the fixed stars are not really immovable, as their

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name would imply, is seen in the phenomenon of *Double* or *Multiple Stars*, systems of two or more stars that revolve about one another, or rather about their common centre of gravity. As they can be seen separate only by means of a telescope, and in most cases require a very powerful one, their discovery was possible only after the telescope was invented. Galileo discovered their existence, and proposed to use them in determining the yearly parallax of the fixed stars. A long time afterward, Bradley, Maskelyne, and Mayer directed attention to the phenomena of double stars; but nothing important was discovered respecting them till the elder Herschel made them the subject of a protracted series of observations, which led to remarkable conclusions as to their nature. The united observations of Struve, Savary, Encke, South, and especially of Herschel the younger, continued for four years in the s. hemisphere at the Cape of Good Hope, have raised the number of observed double, or rather multiple, stars to more than 6,000, of which the greater part are binary, or composed of two, but many are triple, some quadruple, and a few even quintuple, or consisting of five stars. The distance between the stars composing these systems is always apparently small (varying from less than 1" to 32"); but apparent nearness does not always constitute a double star, for two really distant stars are frequently so nearly in the same line, as seen from the earth, that they appear close together. In real multiple stars, the individuals are not only comparatively near one another, but they revolve around one another. Among stars of the first three magnitudes, every sixth is a multiple star; among the smaller stars the proportion is much less. In some cases, one of the stars is much larger than the other, as in the star Rigel in Orion, and in the polar star; but oftener the connected stars are nearly equal in luminous power. The two members of double stars are mostly of one color, but a difference of color is observed in about one-fifth of the whole number. In many of these cases, one color is the complement of the other.

In 1803, after 20 years' observation, Sir W. Herschel advanced the view, which has been more and more confirmed since, that double stars are connected systems of two or more stellar bodies, revolving in regular orbits around one another, or rather round their common centre of gravity. Their motions are found to follow the same laws as prevail in the solar system, and the orbits are elliptical. These distant bodies are therefore subject to the Newtonian law of gravitation. The period of revolution has, in several cases, been roughly approximated. The most remarkable instance of a regular revolution is that of the double star ξ Ursæ Majoris, in which the two stars complete a revolution about one another in 60 years. In the double star 70 Ophiuchi the period of revolution is about 80 years. In cases where the parallax is known, the size of the orbits can be determined; thus the astronomer is able to assert in regard to the double star 61 Cygni that the orbit described by these two stars about each other

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undoubtedly greatly exceeds in dimensions that described by Neptune about the sun. Even the masses of these two stars have been calculated as being together 0·353, that of our sun being 1. It is a consequence of these revolutions that many stars are now seen double that formerly seemed single, and *vice versa*. If the plane of revolution have its edge presented to the earth, the stars will seem to move in a straight line, and at times to cover one another. The star ζ Herculis, seen by Herschel double 1781, appeared single 1802, and was seen double again first by Struve 1826. The figure represents the relative positions of the



Fig. 1.

two stars composing γ in Virgo, at different times since the earliest observations. The period of revolution is presumed to be 182 years.

The *proper motion* of stars, discovered by Halley, is of another kind. It consists in a displacement in various directions of the individual stars, so that the configuration of constellations is slowly changing. 'The Southern Cross,' says Humboldt, 'will not always shine in the heavens exactly in its present form; for the four stars of which it consists move with unequal velocity in different paths. How many thousand years will elapse before its total dissolution cannot be calculated.' The proper motions yet observed vary from $\frac{1}{20}$ of a second to $7''\cdot7$. According to Bessel, the proper motion of the binary star 61 Cygni amounts to $5''\cdot123$, so that in 360 years it would pass over a space equal to the moon's diameter. It must thus take thousands of years to alter sensibly the aspect of the heavens; though, taking into account the enormous distances, the actual velocities must be great. Of 3,000 stars observed by Bessel, 425 had perceptible motion. Argelander has recently published a list of 560 stars having a proper motion.

It was observed first by Sir W. Herschel that there is a perceptible tendency in the stars generally to diverge or open in one quarter of the heavens, and to draw together

in the opposite quarter; and this he attributed to a proper motion of our sun with his planets in the direction of the former point. The apparent motion thus caused is complicated with the real independent motions of individual stars. The point toward which this motion is directed, which is called the 'solar apex,' was fixed by Herschel in the constellation Hercules; and the result of subsequent and independent researches gives a nearly coincident point. The velocity has been calculated at more than 150 millions of miles a year, or 17,600 miles an hour—i.e., rather more than one-fourth of the earth's velocity in its orbit.

The spectroscope has been applied to investigate the physical constitution of the stars, with the result of identifying many of the elements composing our sun and earth. The spectra of the stars differ greatly among one another; some consisting mainly of simple lines, others having complex bands (see SPECTRUM). The simple spectra are believed to indicate great intensity of heat, keeping the molecules of matter in a state of extreme dissociation; while the complex spectra show the molecules more associated in groups or compounds, owing to the repulsive force being less. The bluish stars are the hottest; a red tinge indicates comparative coolness. Our sun seems to be a decaying star.

Several stars exhibit well-marked periodic alterations of a striking nature, and hence are called *variable stars*. A considerable number have been observed, of which the most remarkable are Mira (the 'wonderful') in Cetus, and Algol in Perseus. Mira attains its greatest lustre every 334 days, and appears for 14 days as a star of the second

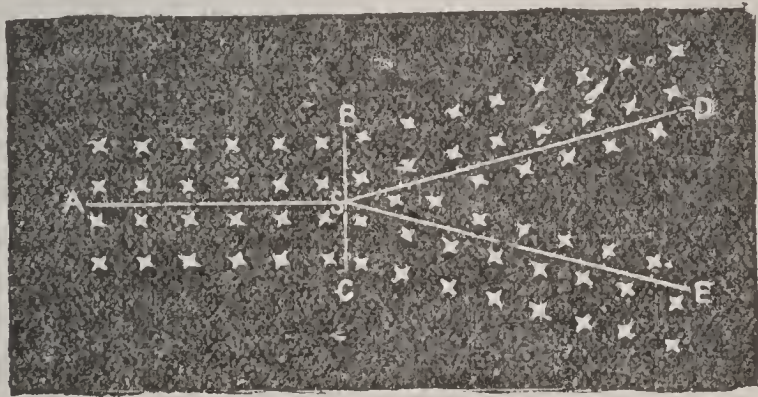


Fig. 2.

and even at times of the first magnitude; it then decreases for two or three months, till it becomes of the sixth and even tenth magnitude, so as to be for half a year invisible to the naked eye and usually to telescopes. After this it begins again to increase, but more rapidly than it decreased. It is visible to the naked eye for three or four months of its period. Of all the variable stars yet observed in Perseus, Algol has the shortest period, being 68 hours 49 minutes. It appears for about 60 hours a star of the second magnitude, then decreases for four hours, and appears for a quarter of an hour of the fourth magnitude,

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after which it increases again for four hours. Various explanations have been offered of these mysterious appearances: no one explanation applies to them all. Where the periods are long, we may suppose that the stars affected have periodic maxima and minima of activity or disturbance analogous to those of our solar system, as exhibited by sun-spots. When the period is short (e. g., in the case of Algol), we may suppose that a large opaque orb circling round the star makes a transit at regular intervals.

Allied to the variable stars are the *new* or temporary stars that appear suddenly in great splendor, and then disappear without leaving a trace. A number of instances are on record. It is not impossible that these also may be periodic.

Star Systems.—From the appearances connected with the Milky Way or Galaxy (q. v.), Sir W. Herschel came to the conclusion that the stars forming our firmament do not extend indefinitely into space, but are limited in all directions, the mass having a definite shape. He conceived the shape to be something like that of a huge millstone, having one side cleft, and the two laminæ set apart at a small angle. Let the diagram (fig. 2) represent a vertical section of such a broad flat stratum, and suppose the solar system situated as at S: to a spectator looking on either side, in the direction of the thickness, as SB, the stars would appear comparatively sparse, but all round in the direction of the breadth (as SA) there would appear a dense ring, which would separate into two branches (SE, SD) in the direction of the cleft side. This supposition accounts for the appearance of the Milky Way, and all



Fig. 3.

START—START POINT.

subsequent observations have tended to confirm the conjecture. Situated as we are within the system, we cannot hope ever to attain more than a rude notion regarding it; to get a definite outline, we must be placed without it.

But this star system which we may call our own, as our sun belongs to it, is but an item in the stellar universe. The appearances known as *nebulae*, in many cases at least, are believed to be similar agglomerations of suns, separated from our system and from one another by unfathomable starless intervals (see *NEBULÆ*). Their forms are very various, but in general somewhat defined, and not without symmetry: the aspect of some is even startling. A few specimens are given in the cut (fig. 3).

START, *n.* *stárt* [Ger. *sturz*, a fall, that which projects abruptly; *stürzen*, to hurl, precipitate: Dan. *styrte*, to fall, precipitate: Dut. *storten*, to hurl or throw headlong]: a sudden and momentary twitching motion of the body; a sudden motion of the body caused by fear; a sudden rousing to action; a quick spring; first motion from a place; act of setting out; advantage in the outset: *V.* to do with a sudden spring; to disturb suddenly, as by fear or ill news; to bring or put into motion; to move suddenly; to shift from its place; to dislocate; to set out; to commence; to bring into view or notice; to shrink; to wince. **START'ING**, *imp.*: *N.* act of one who starts. **START'ED**, *pp.* **START'ER**, *n.* *-ér*, one who starts. **START'INGLY**, *ad.* *-lǝ*, with sudden fits; with frequent intermission. **TO START AFTER**, to set out after; to follow. **TO START AGAINST**, to act as a rival candidate against. **TO START FOR**, to set out on a journey; to be a candidate for, as an office. **TO START UP**, to rise suddenly; to bring into motion. **TO GET THE START**, to begin before another. **TO GIVE A START**, to occasion sudden fear. **TO START A CASK**, to open it. **AN UPSTART**, one who has suddenly come into notice from an inferior state. **STARTUP**, *n.* in *OE.*, same as **UPSTART**; a high shoe: *ADJ.* suddenly come into notice. **STARTING-HOLE**, in *OE.*, evasion; loop-hole. **STARTING-POINT**, the point from which motion begins, or from which a thing moves. **STARTING-POST**, the point from which race-horses begin to run in a race. **FITS AND STARTS**: see under **FIT 1**.

START, *n.* *stárt* [Dut. *stert*; Ger. *stierz*; Icel. *stertr*, a tail]: in *OE.*, a tail, as in *redstart*, the bird with the red tail, also, a handle; a plow-tail.

STARTLE, *v* *stárt'l* [from **START 1**, which see]: to excite with sudden fear or apprehension; to excite by extreme surprise; to shock; to move suddenly in alarm. **START'LING**, *imp.* *-lǝng*: *ADJ.* suddenly impressing with fear; dreadfully surprising. **START'LED**, *pp.* *-ld*: *ADJ.* caused to start; surprised. **START'INGLY**, *ad.* *-lǝ*.—**SYN.** of 'startle': to shock; fright; frighten; surprise; alarm.

START POINT [*AS.* *steort*, a tail or promontory]. rocky headland in s. Devonshire, with a light-house 204 ft. above the sea, lat. 50° 13' 4" n., and long. 3° 38' west.

STARVATION.

STARVATION, or INANITION: terms applied to the phenomena resulting from entire deficiency, or insufficient supply of food. From Chossat's well-known experimental investigations of this subject (*Recherches Expérimentales sur l'Inanition*, Paris 1843), it appears that the average loss of weight in mammals and birds, between the commencement of fasting and the death of the animal, was 40 per cent., the loss varying above and below 40 per cent. in the different organs and tissues, as shown in the table:

| PARTS WHICH LOSE MORE THAN FORTY PER CENT. | PARTS WHICH LOSE LESS THAN FORTY PER CENT. |
|---|---|
| Fat.....93·3 | Muscular Coat of Stomach 39·7 |
| Blood.....75·0 | Pharynx and Œsophagus 34·2 |
| Spleen.....71·4 | Skin33·3 |
| Pancreas.....64·1 | Kidneys.....31·9 |
| Liver.....52·0 | Lungs.....22·2 |
| Head.....44·8 | Bones16·7 |
| Intestines42·4 | Eyes.10·0 |
| Muscles of Locomotion42·3 | Nervous System..... 1·9 |

Hence it appears that there is almost complete removal of the fat, and great reduction of the blood, while the nervous system is scarcely affected; and hence it seems as if the supervention of death was coincident with the consumption of all the combustible materials of the body, and that previously the remaining nutritive force was concentrated on the nervous system.

The following are among the most prominent phenomena which Chossat observed either during the experiments or after the death of the animals: 1. Dropsical effusions. 2. Softening and destruction of the mucous membrane. 3. Blackening of the viscera, especially of the liver. 4. Bluish, livid, yellow, and reddish stains during life in the transparent parts of the skin. 5. Hectic fever, and a continuous decrease in the power of the body to resist cold. 6. At first a scanty excretion of dry, bilious, grass-green feces, and afterward diarrhea of liquid saline matter. 7. Convulsions similar to those in death by hemorrhage. 8. Death by starvation seems to be in reality death by cold; since the temperature of the body is not much diminished until the fat is nearly consumed, when it rapidly falls, unless it be kept up by heat applied externally. 9. Young animals succumbed far sooner than adults. 10. The results of insufficient food were in the end the same as those of total deprivation; the total amount of loss being almost the same, but the rate being less, so that a longer time was required to produce it.

Chossat did not find that much influence was exerted on the duration of life by permitting or withdrawing the supply of water; but there is no doubt that in man, and probably in mammals generally, death supervenes much earlier when liquids as well as solid food are withheld. For full account of the symptoms of starvation in the human subject, see the writings on hygiene and forensic medicine of Orfila, Rostan, Caspar, Taylor, etc.; and especially Dr. Donovan's account of the Irish famine of 1847, in *Dublin Medical Press*, 1848, Feb., p. 67. The following are the most striking symptoms: In the first place,

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pain is felt in the stomach, which is relieved on pressure. The countenance becomes pale and cadaverous; the eyes are wild and glistening; the breath hot, the mouth parched, and the saliva thick and scanty. An intolerable thirst supervenes, which, if there be no access to water, becomes the most distressing symptom. The body becomes gradually emaciated, and begins to exhale a peculiar fetor, while the skin becomes covered with a brownish dirty-looking and offensive secretion almost as indelible as varnish, which Donovan at first mistook for encrusted filth. The bodily strength rapidly declines; the sufferer totters in walking, like a drunken man; his voice becomes weak and whining, and he is ready to burst into tears on the slightest occasion. In the cases recorded by Donovan, imbecility, and sometimes almost complete idiocy, ensued; but in no instance was there delirium or mania, which has been described as a system of starvation in cases of shipwreck. On examination after death, the condition of the body is such as might be expected from Chossat's experiments, viz., extreme general emaciation; loss of size and weight of the principal viscera; almost complete bloodlessness, except in the brain; and the gall-bladder distended with bile, which tinges the neighboring parts. Moreover, decomposition rapidly ensues.

It is impossible to fix the exact time during which life can be supported under entire abstinence from food or drink. Dr. Sloan has given an account of a healthy man, aged 65, who was found alive after having been shut up in a coal mine for 23 days, during the first 10 of which he was able to procure a small quantity of foul water. He was in a state of extreme exhaustion, and notwithstanding he was carefully nursed, he died three days after his rescue. Dr. Willan records the case of a young gentleman who, under religious delusion, starved himself to death. He survived 60 days, during which time he took nothing but a little orange juice: in this case, life was probably abnormally prolonged by the peculiar emotional excitement of the patient. Judging from the cases of abstinence caused by disease of the throat and impossibility of swallowing, Dr. Taylor infers 'that in a healthy person under perfect abstinence, death would not commonly take place in a shorter period than a week or ten days.' In 1880 Dr. H. P. Tanner fasted from all food (using water freely) for 40 days in New York. In the same city Giovanni Succi (1890) fasted 45 days, drinking water *ad libitum*, and taking occasionally a few drops of an 'elixir.'

It is worthy of notice that a deficient supply of food seems to check the elimination and removal of the effete materials of the body. This fact accounts not only for the tendency to putrescence exhibited during the process of starvation, and for the rapidity with which putrefaction ensues after death, but for the pestilential diseases which almost always follow a severe famine; the excess of disintegrated matter in the blood rendering the system especially prone to the reception and multiplication of the diseases characterized as zymotic, such as fever, cholera, etc.

STARVE—STATE.

STARVE, v. *stárvo* [Icel. *starf*, labor, trouble: Norw. *starva*, to go slow and tottering, as a sick or wearied beast: Dut. *sterven*; Ger. *sterben*, to die]: to kill with hunger; to subdue by famine, as a besieged fortress; to perish or die with cold or hunger; to suffer extreme hunger; to be very indigent; to deprive of force or vigor; to kill with cold. **STARV'ING**, imp. **STARVED**, pp. *stárvd*. **STARVATION**, n. *stár-vá'shún*, extreme hunger or want; state of being starved (see below). **STARVELING**, a. *stárv'ling*, hungry; pining with want: N. an animal or plant made thin or weak from want of nutriment.

STASIMORPHY, n. *stás'î-môr'fî* [Gr. *stasis*, a standing; *morphê*, form, shape]: in *bot.*, a deviation in form, arising from an arrest of growth.

STASIS, n. *stás'is* [Gr. *stasis*, a stationary posture]: in *med.*, a stagnation of the blood.

STATANT, *stá'tant*, in Heraldry: term applied to an animal standing still, with all the feet touching the ground. If the face be turned to the spectator, it is said to be *statant gardant*, or in the case of a stag, *at gaze*.

STATE, n. *stát* [OF. *estat*; It. *stato*, state, condition—from L. *status*, condition—from *stāre*, to stand]: circumstances in which a person or thing is placed at any particular time; position; rank; condition: solemn pomp; appearance of greatness; dignity: the whole body of people included under one government; commonwealth; the community; the body politic; the constituents thereof; polity (for state in the American Union, see **STATE, IN THE UNITED STATES OF AMERICA**): one of the orders or classes of men recognized in a country, as the nobles, the clergy (see **STATES**, or **ESTATES**): civil power, as distinguished from ecclesiastical: in *OE.*, seat of dignity; an emblazoned canopy over it: V. to express the particulars of; to set down fully; to repeat with all the attending circumstances; to set forth: ADJ. of or belonging to the state; public. **STA'TING**, imp. **STA'TED**, pp.: ADJ. settled; established; occurring regularly. **STA'TER**, n. *-tér*, one who states. **STA'TEDLY**, ad. *-téd-lî*, at stated or appointed times. **STATEMENT**, n. *stāt'mént*, act of representing facts or particulars verbally or in writing; the recital of the circumstances attendant on a transaction: in *Scotch law*, prisoner's declaration before the sheriff, when under criminal charge. **STATE'LY**, a. *-lî*, lofty; dignified; grand; elevated in sentiment; majestic; august: AD. in a stately manner; majestically. **STATE'-LINESS**, n. *-nēs*, majestic appearance; grandeur in mien or manner; affected dignity. **STATECRAFT**, sometimes in *contempt*, skill in state management. **STATESMAN**, n. *stāts'mān*, one versed in public affairs and the arts of government; one employed in public affairs; a politician: in *provincial usage*, one who occupies his own estate; a small landholder. **STATES'MANLIKE**, a. having the qualities of a statesman. **STATES'MANSHIP**, n. qualifications or skill of a statesman. **STATE-PAPER**, public official document. **STATE-PRISONER**, one charged with political offenses. **STATE-ROOM**, one of the principal magnificent apartments

STATE—STATEN ISLAND.

in a palace or princely mansion: private cabin in a ship; private room (usually for passengers) on a vessel. STATE-TRIAL, a trial for political offenses. SINGLE STATE, the unmarried condition; in *OE.*, individuality.—SYN. of 'state, n.': condition; situation; circumstances; point; crisis; height; rank; community; public; commonwealth; republic; quality; dignity; grandeur.

STATE, n. in *OE.*: contraction for ESTATE.

STATE, IN THE UNITED STATES OF AMERICA: one of the distinct and independent commonwealths which by organizing themselves into a Union as a federal republic—with recognition of one another as in such Union yet severally distinct—do thereby delegate and combine their individual sovereignty in such measure as to constitute one Nation; to which pertains the undivided sovereignty in all matters duly designated as of common concern.—The government of the United States is a substantive part of the government of every several State; and a citizen in any State is, by that fact, a citizen of the United States.—See CONSTITUTION OF THE UNITED STATES: FEDERAL GOVERNMENT: CONFEDERATION OF THE THIRTEEN AMERICAN COLONIES.

STATEN ISLAND, *stät'en*: beautiful and picturesque island, comprising Richmond co., N. Y.; bounded n. by the Kill van Kull; e. by New York Harbor, New York Bay, and the Narrows; w. by Staten Island Sound; s.s.e. by Raritan Bay and the lower bay of New York: extreme length 14 m., extreme breadth 8 m.: 58½ sq. m.; named by the Dutch in honor of the staats-general. Its surface is pleasantly diversified, rising from the water's edge to central wooded heights, affording charming sites for suburban residences. It is connected with New York and N. J. by several lines of ferry-boats; is traversed by the Staten Island Rapid Transit railroad; and contains 5 towns, Castleton, Middleton, Northfield, Southfield, and Westfield, with numerous villages and pleasure resorts, as Tompkinsville, Stapleton, and Clifton on the e. shore, New Brighton, Sailor's Snug Harbor, Castleton, Port Richmond, and Elm Park on the n. shore, with St. George and South Beach at the extremities. A new railroad bridge connects the island with N. J. near Elizabeth, being a part of the Baltimore and Ohio railroad system. At the Narrows point are Forts Tompkins and Wadsworth, with Battery Hudson and a line of water-batteries, while Fort Hamilton is on the opposite (Long Island) shore, with Fort Lafayette between. A bill was introduced into congress 1890 to authorize the construction of a tunnel under New York Bay to connect S. I. with Long Island, presumably to promote a scheme for the creation of a great ocean steamship port at Montauk, L. I., and to give the trunk lines of railroad centring on the N. J. shore a Brooklyn terminus.—Pop. (1880) 38,991; (1890) 51,693 (Castleton 16,423, Middleton 10,557, Northfield 9,811; Southfield 6,644; Westfield 8,258); (1900) 67,021,

STATEN ISLAND—STATES.

STATEN ISLAND: island off the s.e. point of Tierra del Fuego, from which it is separated by the Strait of Le Maire; about 45 m. long from e. to w., and about 10 m. at its greatest breadth. Its shores are much indented. Its e. extremity is Cape St. John, lat. $54^{\circ} 42'$ s., long. $63^{\circ} 43'$ w. The surface is mountainous, descending to the sea in steep slopes and precipices; its general character similar to that of Tierra del Fuego.

STATES, or ESTATES, in Politics: classes of the population in a country, who either directly or by their representatives take part in the government. In all European countries where the northern conquerors established themselves, the rudiments of representative government appeared in the form of assemblies brought together to deliberate with the sovereign on the common weal. These assemblies at first consisted of the two estates—Clergy (q.v.) and Nobility (q.v.) or baronage, who together constituted the whole free population of the realm; the nobility including not merely the greater barons, but the whole body of freeholders. As the burgesses gradually emancipated themselves, and rose into importance, they formed a third estate (see BURGESS). In France, we find the *tiers état* (third estate), or citizens, recognized in the States-general (q.v.) 1302. In Scotland, the earliest occasion on which the burghs are mentioned as attending and concurring in a grant of taxation, is in the parliament at Cambuskenneth 1326. The burgesses, represented by the commissioners for the burghs, continued in Scotland a separate estate, not, as in England, amalgamated with the knights and lesser barons who, in the Scots parliament, were always classed with the baronage. The lesser barons were, however, first allowed, and latterly enjoined, to appear by representatives; and the three estates, clergy, barons, and burgesses, all sat and deliberated in one house. In England, on the other hand, the knights and lesser barons were at an early period separated from the greater barons, and conjoined with the burgesses into the third estate, which occupied a separate chamber from the lords spiritual and temporal. This peculiarity in the original constitution of the *tiers état* of England necessarily gave it a weight which it did not possess elsewhere, and exercised an important influence on the constitutional history of the country. As the peasants became emancipated, we find them also in some countries taking share in the legislative power, either as a part of the *tiers état*, or, as in Sweden, forming a fourth estate. The four estates, nobles, clergy, citizens, and peasants, were recognized in Sweden till 1866; and in the Swedish legislature, as constituted, each had its separate chamber. Throughout Europe, except in Russia (though in some small German states, such as Mecklenburg, the diet, representing only the landed gentry and the towns, has very little authority), the co-operation of the estates with the sovereign in the legislative power is more or less recognized. Some assemblies have but one chamber, but more of them have two. The lower chamber is always wholly, or partly, elective: but

STATE'S EVIDENCE—STATES-GENERAL.

consists sometimes of separate delegates from the different orders of the community, and has representatives of landed proprietors, of towns, of peasants, and of traders and manufacturers. The upper house or senate is in some constitutions hereditary; in some, it consists of members named by the sovereign or by the nobility, or some other class of the community; and often it combines these elements. In a few instances, it is elected by the same constituency as the lower house, and differs only in the higher property qualification required of its members.

STATE'S EVIDENCE: testimony of an accomplice in crime against his fellows, given in court in consideration of an expressed or implied promise of the prosecution that the informer shall go unpunished. The fact that he purchases impunity for himself by fixing guilt on his accomplices often renders his testimony suspected; hence usually S. E. carries little weight unless confirmed by testimony not tainted by self-interest.

STATES' GENERAL (Fr. *états généraux*): name, prior to the Revolution of 1789, for the convocation of the representative body of the three orders of the French kingdom—the nobles, the clergy, and the people; so named in distinction from the *états provinciaux*, or assemblies of the provinces. As far back as the time of Charlemagne there were assemblies of clergy and nobles twice a year to deliberate on public concerns; and in these assemblies the extensive body of laws bearing the name Capitularies of Charlemagne was enacted. The succeeding centuries, however, were adverse to free institutions; and these national convocations, becoming gradually less important, seem to have ceased about 70 years after Charlemagne's death. From that time forward, there is no trace of any national assembly in France till 1302, when the *états généraux*, including the three orders, clergy, nobles, and citizens, were convened by Philippe le Bel, with the view of giving greater weight to the course adopted by the king in his quarrel with Pope Boniface VIII. In 1314 we find the S.-G. granting a subsidy; during the reigns of Philippe IV. and his successor, the imposition of taxes by arbitrary authority was the subject of general discontent; and 1355, the states were strong enough to compel the government to revoke the taxes so imposed. The S.-G. however, though their consent seems in strictness to have been considered requisite for any measure imposing a general taxation, had, unlike the assemblies under the Carlovingian kings, no right of redressing abuses except by petition, and no legislative power. Under Charles VI. and Charles VII. the S.-G. were rarely convened, and it was often found more convenient to ask supplies from the provincial states. But as the royal authority increased, the formality of any convention of states general or provincial gradually ceased to be regarded as indispensable, and a final and unsuccessful struggle for immunity from taxation took place at the S.-G. of Tours 1484. Louis XIII. convoked the S.-G., after a long interval, 1614, but dismissed them for looking too closely into the finances; and from that time till the Revo-

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lution, the crown, with tacit acquiescence of the people, exercised the exclusive powers of taxation and government. In 1789 the memorable convention of the S.-G. took place, which ushered in the Revolution. As soon as they had assembled, a dispute arose between the two privileged orders and the third estate as to whether they should sit and vote in one chamber or separately. The *tiers état*, of its own authority, with such deputies of the clergy as chose to join them—none of the nobles accepting their invitation—assumed the title of *Assemblée Nationale*, a name by which the S.-G. had previously been sometimes designated. See ASSEMBLY, NATIONAL.

The name S.-G. is applied also to the now existing legislative body (in two chambers), of the kingdom of the Netherlands (q.v.): so called in distinction from the provincial states, which are legislative and administrative assemblies for the several provinces.

STATICE, n. *stăt'î-sē* [Gr. *statikē*, an astringent herb—from *statikos*, making to stop]: genus of plants of nat. order *Plumbaginææ*, having a funnel-shaped, membranaceous, and plaited corolla; the flowers in spikes. Several species grow near the sea, on muddy shores and in salt marshes. the root of *S. Caroliniana*, called Marsh-rosemary, is used in N. America for all the purposes of kino and catechu, and is a very powerful astringent: see MARSH-ROSEMARY.

STATICS, n. *stăt'îks* [Gr. *statikos*, at a standstill—from *statos*, standing still]: branch of mechanics which treats of the equilibrium, weight, pressure, etc., of bodies at rest. STATIC, a. *-îk*, or STAT'ICAL, a. *-î-kāl*, pert. to bodies at rest or in equilibrium. STAT'ICALLY, ad. *-kāl-lî*—*Statics*, as the science of the equilibrium or balancing of forces on a body or system of bodies, has gradually advanced since the days of Archimedes to its present vast development. Singularly, though most of its simpler theorems are generally known, indeed are almost popular, in no science is elementary teaching so defective. The ordinary proofs of its fundamental principles, e.g., the *Parallelogram of Forces*, the *Principle of the Lever*, etc., are founded usually on the supposition that a body in equilibrium is *absolutely at rest*. Now, any one who knows that the earth rotates about its axis, that it revolves about the sun, that the sun is in motion relatively to the so called fixed stars; that *they* are, probably, in motion about something else which itself is in motion, etc., will at once see that there is no such thing as absolute rest; and that *relative rest* or motion, unchanged with reference to surrounding bodies, is all that is meant by equilibrium. He will then, at once, see that the foundations of statics are to be sought in the LAWS OF MOTION (q.v.). And, in fact, Newton's Second Law of Motion gives the necessary and sufficient conditions of equilibrium of a single particle under the action of any forces; while his Third Law, with the annexed Scholium, gives these conditions for any body or system of bodies whatever.

The simplest statement of the conditions of equilibrium of a rigid body which can be given, is that furnished by this Scholium of Newton's now known by the name Prin-

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ciple of Energy (see FORCE) or Work (q.v.). It is as follows: A rigid body is in equilibrium if, and is not in equilibrium unless, in *any* small displacement whatever, no work is done on the whole by the forces to which it is subject. In the case of what are called the *Mechanical Powers* (q.v.), this is equivalent to the statement that work expended on a machine is wholly given back by the machine—or that the work done by the *power* is equal to the work spent in overcoming the *resistance*.

It is shown in the geometrical science of Kinematics that any motion whatever of a rigid body can be reduced to *three* displacements in any three rectangular directions, together with *three* rotations about any three rectangular axes—so that the equilibrium of a rigid body is secured if no work be done on the whole in any of these *six* displacements. There are thus six conditions of equilibrium for a rigid body under the action of any forces—and these are reduced to *three* (two displacements and one rotation), if the forces are confined to one plane; and to *one* (a displacement), if the forces act all in one line.

Equilibrium may be *stable*, *unstable*, or *neutral* (see STABILITY AND INSTABILITY). It is said to be stable, if the body, when slightly displaced in any way from its position of equilibrium, and left free, tends to *return* to that position. It is unstable, if there is any displacement possible, which will leave the body in a position in which it tends to *fall further away* from its position of equilibrium. It is neutral, if the body, when displaced, is still in equilibrium. It is easily shown, but space is lacking here for the proof, that a position of stable equilibrium is, in general, that in which the Potential Energy (see FORCE) of the body is a minimum—of unstable equilibrium, where it is a maximum (for some one direction of displacement at least)—of neutral equilibrium, where the potential energy remains unchanged by any small displacement. Thus, a perfect sphere, of uniform material, is in neutral equilibrium on a horizontal plane—while an oblate spheroid, with its axis of rotation vertical, is in stable equilibrium; and a prolate spheroid, with its axis vertical, is in unstable equilibrium on the plane. Similar statements hold for other than rigid bodies. Thus, a chain, or a mass of fluid, is in stable equilibrium when its potential energy is least, i.e., when its centre of gravity is as low as possible. This simple statement is sufficient for the mathematical solution of either question.—SEE DYNAMICS.

STATION, n. *stā'shŭn* [F. *station*, a station—from L. *statiō* or *statiōnem*, a station, a post—from *stārĕ*, to stand: in mid. L. and even in classical times, *statiō* was applied to a stall or shop]: the spot or place where a person stands; post assigned; position; rank or condition of life; office; a halting or starting place on a railway; a police-office; in *bot.*, the region occupied by any particular plant, being the locality which presents the conditions most favorable for its growth and development; in *mil.*, the quarters of a regiment, or the place where located; in *nav.*, a port where there is accommodation for ships of war; also, the place assigned to a

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ship of war in foreign parts; in *OE.*, the act of standing: V. to place; to appoint to the occupation of a certain post or point. STA'TIONING, imp. STA'TIONED, pp. *-shūnd.* STA'TIONAL, a. *-shūn-āl*, pertaining to a station. STA'TIONARY, a. *-ēr-ī*, fixed; not moving; not advancing; not improving. STA'TIONER, n. *-ēr* [so named from being originally one who had a *station* or *stall* in a market-place]: *originally*, a bookseller; *now*, a dealer chiefly in paper, pens, ink, and all other materials employed in writing. STA'TIONERY, n. *-ēr-ī*, articles sold by stationers: ADJ. of or belonging to a stationer. STATION-MASTER, an officer in charge of a railway station. STATIONARY ENGINE, a fixed steam-engine for drawing carriages on railways by means of a rope. STA'TIONS OF THE CROSS, certain points in the narrative of the passage of Christ from the judgment-seat to the cross, selected as subjects for meditation at fixed spots in the church and sometimes in the parish itself; the places where ecclesiastical processions rest, or which are visited in rotation by individuals, for the performance of any act of devotion; *formerly*, in the *Rom. Cath. Chh.*, the weekly fasts of Wednesdays and Fridays (see STATIONS, in *Rom. Cath. Observance*). STATIONERS' HALL, govt. institution in London, founded 1553, where printed works, etc., are registered in every case of copyright. STATIONERY OFFICE, govt. institution in London, established 1786 for purchase and supply of all writing materials for the govt. offices throughout the Brit. empire: also it contracts for printing of all reports, etc., laid before the house of commons.—SYN. of 'station, n.': depot; stall; post; office; situation; position; employment; character; rank.

STA'TIONS, in *Rom. Cath. Observance*: certain places reputed of special sanctity, appointed to be visited as places of prayer. In this sense, the name is applied particularly to certain churches in the city of Rome, which, from an early period, have been assigned for the special visits of the faithful on stated days: the names of these churches are found on the several days in the Roman missal prefixed to the liturgy peculiar to the day.—The word is employed also in reference to a very popular and widely-received devotional practice of the *Rom. Cath. Church*, known as that of 'The Stations of the Cross,' in which several incidents of the last earthly days of the Lord Jesus are enumerated; viz.: (1) his sentence to death; (2) taking up the cross; (3) falling under the cross; (4) meeting his mother; (5) Simon of Cyrene carrying the cross; (6) the wiping of the face of the Lord Jesus by St. Veronica (q. v.); (7) his second fall beneath the cross; (8) his words to the women of Jerusalem; (9) his third fall under the cross; (10) his being stript of his garments; (11) his crucifixion; (12) his death; (13) taking his body down from the cross; (14) his burial. This devotion prevails in all *Rom. Cath.* countries; and the traveller often recognizes it even at a distance by the emblems employed in directing its observance—the lofty 'Calvary' crowning some distant eminence, with a series of fresco-pictures or bas-reliefs arranged for the 'stations' at intervals along the line of

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approach. These representations, whose subjects are scenes from the several stages of Christ's Passion, are called Stations of the Cross; and the whole series is popularly known as the *Via Calvaria*, or Way of Calvary. The origin of this exercise, like that of local pilgrimages, is traceable to the difficulty of access to the Holy Places of Palestine, consequent on the Turkish occupation of Jerusalem and the Holy Land; these representations being designed to serve as some analogous incentive to the piety and faith of the Christian worshipper of the Lord Jesus in his Passion. The devotional exercise itself is performed by kneeling at the several stations in succession, and reciting certain prayers at each. Forms of prayer are prescribed to those who can read. The poor and ignorant recite the Lord's Prayer and Hail, Mary! all being directed to fix their thoughts in grateful memory on 'the sufferings which each representation describes our Lord as having undergone, in atonement for the sins of mankind.' Many 'indulgences' are granted to those who, having duly repented of their sins, piously perform this exercise. Many of these stations are celebrated as works of art, especially one near Bologna. Some in the Alps and along the precipitous banks of the Rhine, Danube, and other German rivers, are exceedingly striking and picturesque.—For various ancient uses of the term Station, see '*Statio*,' in Smith and Cheetham's *Dic. of Christian Antiquities*.

STATISTICS, n. plu. *stăt-tis'tîks* [F. *statistique*, statistics—from Gr. *stătōs*, fixed, placed]: facts, largely numerical, more or less systematized, regarding the condition of a nation, or of any society, in its domestic economy, in the health and longevity of its people, in its population, wealth, trade, etc.; science of collecting and arranging all the numerical facts relating to any subject. STATIS'TIC, a. *-tîk*, or STATIS'TICAL, a. *-tî-kăl*, of or relating to the state or condition of a people or nation with respect to extent, population, wealth, etc. STATIS'TICALLY, ad. *-lî*. STATISTICIAN, n. *stăt'tis-tîsh'ăn*, one who is skilled in the matter of statistics. STATIST, n. *stăt'îst*, one skilled in knowledge of the facts regarding the condition of a nation, etc.; a statistician; in *OE.*, a statesman; a politician.—*Statistics* as a branch of Political Science are concerned with the gathering and compilation of facts, largely numerical, bearing on the condition, social, moral, and material, of a *state*, or other large group of people. The word S. was used first in the middle of the 18th c., by Prof. Achenwall of Göttingen, who has been called 'the father of modern statistics.' The principle at the foundation of S. is, that the laws which govern nature, especially those which govern the moral and physical condition of mankind, are constant, and are to be discovered by investigation and comparison of phenomena extending over a very large number of instances. Accidental diversities tend to neutralize each other, their influence diminishing as the area of investigation increases; and if that area be sufficiently extended, they so nearly disappear that we are entitled to disregard them altogether. While the length of

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a single life cannot be counted on, an average of 1,000 or 10,000 lives gives us a constant quantity, sufficiently near the truth to answer the purposes (e.g.) of insurance companies. Even the acts which are the most purely voluntary, as done by individual men, have been found subject to laws which, relative to the masses which make up society, are invariable in like circumstances and are in large measure discoverable.

The science of S. has a twofold relation to political and social economy. The facts collected by the statist are the bases on which political economy rests: their application to social and economical problems is an appeal from imagination or theory to fact. But the statist must be guided by the political economist as to the direction in which to extend his investigations: without political economy we should have had no statistics.

Every branch of human knowledge, every sphere of human physical, social, intellectual, moral, religious life—thus every science—has its special S. The most common application of the term is in the department of political economics, relative to trade, industry, finance, taxation, and national condition, especially as to material welfare; in which department S. have been classified as relative—(1) to the nature of wealth and its production and growth in a community; (2) to inland and foreign trade; (3) to taxation and finance; (4) to currency, banks, and prices; (5) to wages and hire of labor, and to division of employments; (6) to the functions of the state as regards interference with the economic relations of its citizens.

The statistical section added to the Brit. Assoc. for Advancement of Science, 1833, and the London Statistical Soc., founded 1834, have made valuable contributions to this science. An international statistical congress convened in Brussels 1853, at the suggestion of J. C. G. Kennedy, supt. of the U. S. census; and its successive meetings have been held in great cities—Paris, Vienna, London, Berlin, Florence, St. Petersburg, etc. Adolph Quetelet, eminent French statistician, gave invaluable aid to its success in its work of systematizing the S. of nations represented. Statisticians from this country also rendered notable service.

S. may be said to be specially in the province of government: its most important subjects cannot be investigated without unrestricted access to govt. offices; and the ordinary administration of govt. is continually affording opportunities for collection of statistical facts. For some time past, S. have largely occupied the attention of the more enlightened European states. The statistical reports issued by the various departments of the French govt. deserve especial praise for comprehensiveness and for clearness of arrangement. In Great Britain, a department of the board of trade has, since 1832, been charged with collecting and publishing S. of wide range.

In the United States there is an immense field for statistical information; and official publications are very numerous. Each executive dept. of the general govt. issues weekly, monthly, quarterly, or annual publications

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purely statistical, besides regular and special issues, for diffusion of specific information. Of the former class, the treas. dept. issues four of large comprehensiveness: the annual reports of the sec. on (1) *Finance*, (2) on *Foreign Commerce, Immigration, and Tonnage*, and those of its bureau of S.; (3) the *Quarterly Report* on imports, exports, immigration, navigation, trade, industries, etc.; (4) the *Statistical Abstract of the United States* (annual). The dept. of the interior comprises many bureaus—e.g., education, Indian affairs, U. S. land office, the various surveys, etc.; each of which issues regular reports, some being the costliest publications in the country. The bureau of education, besides its very full annual reports on the educational institutions of the country, has been issuing for several years frequent *Circulars of Information*, dealing with both statistical and historical matters. The new dept. of agriculture issues an annual report, monthly crop reports, and daily weather reports, and from time to time special pamphlets on matters of current interest to agriculturists. The state dept. has been publishing, since 1880, very valuable reports from the U. S. consuls, giving statistical information of an industrial and commercial character from all the great foreign cities of the world, and 1891 was issuing special reports on the American republics. State govts. also publish a variety of such information, concerning their own condition, progress, and needs, many doing so to attract capital, skilled labor, and immigration. Since 1872, particularly since 1884, there has been a noticeable movement among the states to create bureaus of statistics of labor and industry; and 1891 there were a U. S. dept. of labor, similar bureaus in 24 states, and a national assoc. of chiefs of bureaus.—There was (1891) also a National Statistical Assoc., incorporated, and composed largely of publicists and specialists in professional work, with headquarters in Boston. To this mass of periodical statistical literature should be added the innumerable trade journals, and the valuable almanacs now issued by the great newspapers.

STATOBLASTS, n. plu. *stăt'ō-blăsts* [Gr. *stātos*, stationary; *blastos*, a bud]: in *zool.*, certain reproductive buds developed in the interior of polyzoa, but not set at liberty till the death of the parent organism.

STATUA, n. *stăt'ū-ă*: OE. for **STATUE**.

STATUE, n. *stăt'ū* [F. *statue*—from L. *statuā*, a statue, an image—from *status*, a standing, position—from *sto*, I stand: It. *statua*]: representation of a living being in some solid substance, e.g., marble, stone, bronze, etc.; an image: V. in *OE.*, to place as a statue; to form as a statue. **STAT'UARY**, n. *-ēr-ī*, one who carves images or statues; art of carving figures out of stone, marble, etc., to represent human beings or animals; a collection of statues, or statues considered collectively (see **SCULPTURE**). **STAT'UED**, a. *-ūd*, furnished with statues. **STAT'UESQUE'**, a. *-ū-ěsk'*, having the character of a statue. **STAT'UETTE'**, n. *-ět'*. a small statue.

STATURE—STATUTES.

STATURE, n. *stăt'ūr* [F. *stature*—from L. *statūrā*, an upright posture, height or size of the body—from *sto*, I stand: It. *statura*]: the height or size of any one standing. **STAT'URED**, a. *-ūrđ*, arrived at full stature; proportioned.

STATUS, n. *stă'tūs* [L. *status*, a standing—from *sto*, I stand]: standing or place; the state or condition of a thing; position of affairs; condition; rank.

STATUTE, n. *stăt'ūt* [F. *statut*, a statute—from L. *stat-ūtus*, fixed or settled, appointed; *statuĕrĕ*, to fix—from *status*, position (see **STATE**)]: an act of the legislature or supreme power of a state commanding or prohibiting a thing; an enactment; a written law (see **STATUTES**, **LEGISLATIVE**): act of a corporation or of its founder. **STAT'UTABLE**, a. *-ŭ-tă-bl*, according to statute or law; made or being in conformity to statute. **STAT'UTABLY**, ad. *-blĭ*. **STATUTORY**, a. *-tĕr-ĭ*, enacted by statute. **STATUTE BOOK**, a book containing statutes or laws; the whole body of the laws of a nation. **STATUTE-LABOR**, a certain amount of labor exacted for the public service in making roads, bridges, and the like, usually commuted into a money payment. **STATUTE OF DISTRIBUTIONS** (see **DISTRIBUTIONS**, **STATUTE OF**). **STATUTE OF FRAUDS** (see **FRAUD**), English statute requiring certain contracts and agreements to be in writing, in order to be binding. **STATUTE OF LIMITATIONS**, a law which prescribes the time within which any action at law must be commenced (see **LIMITATION**).—**SYN.** of 'statute, n.': enactment; act; edict; regulation; decree; proclamation; rule; ukase.

STATUTES, LEGISLATIVE: those laws made from time to time by the legislature, which qualify and alter the common law or previous statutes. All laws may be divided into common law and statutory law, the former unwritten, the latter written: see **LAW: COMMON LAW**. The theory as to the common law in England—and in the United States, in which from the first it was an inheritance from England—is, that it consists merely of ancient usages, accepted by all, of which the written exposition has or may have perished, but which tradition has kept alive; and much of the common law necessarily consists of what has sometimes been called judge-made law—a department often ignorantly denounced as illegal or unconstitutional, but which is a necessary part of every code, under whatever name disguised. The legislature of Great Britain consists of the queen, lords, and commons in parliament assembled; and the statutes which they pass were likened by Sir Matthew Hale (q.v.) to written contracts or indentures—the general public being bound, by their respective agents, as if by solemn deed. There is no legal mode of altering the previously existing law, except by a statute passed with consent of the legislature; though there are other ways of modifying the law so far as mere details of administration are concerned. Statutes (acts of congress, acts of parliament, etc.) all are founded on the theory that the legislature has inherent right to alter all previous laws or S.; and though sometimes great and

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leading S. have been declared unalterable by any future legislation, this restriction is obviously utterly futile, and inconsistent with the idea of a legislature. There are certain important rules as to the interpretation of S., the chief business of the various courts of law and of equity being to construe or interpret the S. The leading rule in construing S. is, that the words are to be taken in their ordinary grammatical sense, unless the context shows that they are used in some other sense. All other rules resolve more or less into this. There is also a well-known rule that penal S. are to be construed less strictly than those of a remedial kind. Another rule is, that a subsequent statute repeals one that is prior, either expressly or by necessary implication, if the prior one is inconsistent in substance. Though it might seem an easy task to construe what is meant by a statute, it is in practice so far from easy that it requires a special training and long experience—the chief business of lawyers being to acquire this art.

The acts of the U. S. congress and of the legislatures of the several states, of the Brit. parliament, and of other legislative bodies, are called statutes: these qualify and alter the Common Law (q.v.); and the sum of them constitutes the 'statute law,' or 'positive law,' as distinguished from the 'common law,' or the unwritten law. See PROCEDURE, RULES OF LEGISLATIVE AND DELIBERATIVE.—A *penal* S. prohibits or commands under penalty. A *declaratory* S. determines authoritatively the meaning of another S. Statutes are either *public* or *private*: a *public* S. has force either throughout the whole commonwealth or in a restricted locality; a *private* S. concerns only particular persons. A *perpetual* S. runs for an indefinite time, or till repealed; a *temporary* S. runs for a definite period.—It is a principle of law that when a S. gives a power, it gives by implication all the necessary legal faculty for exercising that power. In the United States, any S., whether of the federal congress or of a state legislature, that contravenes a provision of the U. S. constitution is so far void: the same is to be said of the statutes of the several states with respect to their several constitutions. But if only a part of a S. is in conflict with constitutional provision, that part alone is void: the rest of the S. has the force of law if it can stand by itself. Usually, in the United States, statutes take effect immediately on completion of the formalities of enactment; but the S. itself may set a date for its coming into force.—The statutes of the Brit. parliament are in force when they have received the assent of the sovereign.—In France, the statutes of the national legislature take effect in each department of the republic as many days after promulgation in the same as there are distances of 20 leagues between the place of promulgation and the seat of govt.—The *Revised Statutes of the United States* is a compilation of the acts of congress approved by congress 1874, June 22, and thereby enacted into law. That first ed. of the *Revised Statutes* comprised all the laws of the United States in force 1873, Dec. 1. A second ed. was pub. 1878, comprising the first ed. as amended by the 43d

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and 44th congresses. A supplement was pub. 1881, containing the acts of congress 1874-80. The *Revised Statutes* is the authentic and authoritative expression of the laws, and must be accepted as such, without reference to the original acts of congress, except in cases of ambiguity or uncertainty: then the statutes themselves may be quoted to exhibit the true intent of the law-makers. The U. S. senate and the U. S. house of representatives have each a standing committee on 'revision of the laws of the United States.'—See ACT OF CONGRESS: BILL: CONGRESS: PARLIAMENT.

STAUBBACH, *stowb'bách*, FALL OF: celebrated waterfall in the s. part of the canton of Bern, Switzerland, a mile from the village of Lauterbrunnen, 8 m. s. of Interlaken. It is one of the loftiest in Europe, having a descent of between 800 and 900 ft.; but it often disappoints visitors, who expect a swift loud-roaring cataract, and find instead a slender stream of water, concealing the face of the precipice like a 'beautiful lace veil, and imitating in its centre the folds of the drapery.' Long before it reaches the bottom, it is blown into a dust of silver spray, whence its name *Staubbach* (Dust-stream). Byron and Wordsworth praised it in verse.

STAUNCH, a. *stúnsh* [see STANCH]: sound; firm in principles, or in the support of a cause; trusty; zealous. STAUNCH'LY, ad. -*lǐ*. STAUNCH'NESS, n. -*nēs*.

STAUNTON, *stawn'ton*: city, cap. of Augusta co., Va.; on the Baltimore and Ohio and the Chesapeake and Ohio railroads; 60 m. n. of Lynchburg, 136 m. w.n.w. of Richmond. It is in the largest and most important agricultural co. in the state; is easily accessible to the great coal and coke producing fields of Connellsville, Pocahontas, and New River, and to the vast timber resources of the Blue Ridge and Alleghany Mountains; and has near it the largest manganese mine in the United States, besides several rich beds of colored marbles. Weyer's and Madison's caves are 18 m. distant, and Augusta Springs 12 m., all connected with S. by stage lines. The city contains a milit. institute; Presb., Prot. Episc., Meth. Episc. S., Lutheran, and Rom. Cath. seminaries; one of the state lunatic asylums; State Institution for the Deaf, Dumb, and Blind; co. court-house; 10 churches; several grammar schools; high school; 2 national banks (cap. \$200,000); gas and electric lights; opera-house; and 1 daily and 6 weekly periodicals. The manufactures include foundry products, flour, carriages, shoes, ice, furniture, tannic acid, sashes, doors, and blinds, and fertilizers. Pop. (1880) 6,664; (1890) 6,975; (1900) 7,289.

STAUNTON, *stán'ton*, HOWARD: 1810-1874, June 22; b. England. After studying at Oxford, he settled in London, and became famous for his skill at chess and his acquaintance with the works of Shakespeare and the other Elizabethan dramatists. He won from St. Amand the chess championship of Europe 1843; and as a writer on chess held a place among the most eminent authorities on the game. He was long the editor of a paper devoted to

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chess, and edited a chess column in the *Illustrated London News*. Among his books were: the *Chess-player's Handbook*; the *Chess Tournament*; *Chess Praxis*; editions of Shakespeare's *Plays and Poems*, one in 3 and another in 4 vols.; *Memorials of Shakespeare*; and *The Great Schools of England*. He died in London.

STAUNTON RIVER: stream in s.w. Va., having its source in the Alleghany Mts. in Montgomery co.; passing through a notch in the Blue Ridge Mts.; in its s.e. course separating the counties of Bedford, Campbell, and Charlotte on the n. from those of Franklin, Pittsylvania, and Halifax on the s.; and at Clarksville, Mecklenburg co., uniting with the Dan to form the Roanoke river. It is 200 m. long and falls about 1,000 ft. in the first 20 m. of its course.

STAUPITZ, *stow'pīts*, JOHANN VON: date and place of birth not known; d. Salzburg, Austria, 1524, Dec. 28: Rom. Cath. ecclesiastic and friend of Luther. He studied at Tübingen and other universities; was prior of an Augustinian convent 1500; was invited by Frederick the Wise to aid in establishing the Univ. of Wittenberg; was prof. of theol. and dean there 1502; vicar-gen. of the German convents of his order 1503; introduced the reading of the Scriptures in the same in place of St. Augustine's writings 1512; was substitute for the Abp. of Salzburg in the Lateran council the same year; and abbot of the Benedictines, vicar of the abp., and court preacher at Salzburg 1519. By him, Luther was turned from ascetics and metaphysics to the study of the doctrine of redemption, was made prof. at Wittenberg, and preacher, was appointed inspector-gen. of 40 convents, also was accompanied by S. in the discussion at Augsburg; but S. followed no further in the Reformation. He wrote some tracts, e.g., on the love of God and the following of Christ; and 10 of his letters have been published.

STAURO-, prefix *staw-ro* [Gr. *stauros*, a cross]: pertaining to or resembling a cross; having processes in the form of a cross.

STAUROLITE, n. *staw'rō-līt* [Gr. *stauros*, a cross; *lithos*, a stone]: a silicate of alumina and iron of a dull or reddish-brown color whose crystals often intersect each other—occurs embedded in mica-, talc-, or clay-slate: also STAUROTIDE.

STAVANGER, *stā-vâng'ghēr*: town, cap. of a large dist. in the s.w. corner of Norway, on the Stavanger Fiord, 35 m. n.w. from the Naze, 100 m. s. of Bergen. It is a prosperous port. Its trade depends mainly on various branches of the fishing industry; and it has two good harbors, protected by islands. The city dates from the 11th c., and has ancient cathedral, built 1013; also very fine schools and municipal buildings. There are cloth-manufactories and distilleries; also ship-building, and an export-trade. Pop. (1801) 2,500; (1881) 23,500; (1891) 23,930.

STAVE—STAY.

STAVE, n. *stāv* [another form of **STAFF**, which see: Icel. *stafr*, a pole; *stef*, a stave in a song]: a pole of some length; one of the bars of which a cask is made up; a metrical portion; in *music*, the five parallel lines, and the four contained spaces on and within which musical notes are written; in *Scot.*, a verse, or so much of the psalm as is given out at once by the precentor, to be repeated by the congregation: **V.** to break a hole in; to burst, as a cask; to furnish with staves. **STA'VING**, imp. **STAVED**, pp. *stāvd*: **ADJ.** furnished with staves. **TO STAVE IN**, to break a hole in, as in a cask.

STAVESACRE, *stāvz-ā'kr* [corrupted from Gr. *staphis*, a grape; *agrios*, wild], (*Delphinium staphisagria*): plant, popularly called Louse-wort, species of Larkspur (q.v.), native of s. Europe. The seeds have been used in medicine from ancient times. They are too violently emetic and cathartic for safe use; but in powder they are applied to cutaneous eruptions, and are used for killing lice. Their properties depend on an alkaloid, *Delphinia* ($C_{24}H_{35}NO_2$), now used in medicine instead of the seeds, chiefly in rheumatism and neuralgia.

STAVROPOL, *stāv rō'pōl*: government in Russian Caucasasia, bounded e. by the Caspian Sea, s. by the Caucasus; 27,000 sq. m. The chief rivers are the Kuban and Terek, and the Kuma. In the s.w., where the soil is fertile, and produces millet and wheat, agriculture is the chief employment; in the n.e. the inhabitants lead a nomad life. Vineyards line the banks of the Terek and Kuma, and mulberry-trees are cultivated for rearing of silk-worms. —Pop. (1880) 475,000; (1889) 667,511.

STAVRO'POL: town, cap. of the govt. of S., Russia; on the chief highway from Europe to the Caucasus, 200 m. s.e. of Rostov. Pop. (1880) 34,350.

STAW, v. *staw* [Ger. *stauchen*, to stow or cram into a cask or vessel: Low Ger. *stauen*, to pack, to dam]: *prov. Eng. and Scot.*, to glut; to clog; to surfeit; to disgust. **STAW'ING**, imp. **STAWED**, pp. *stawd*. *Note.*—**STAW** may be only a broad pronunciation of *stall*, in the sense of 'standing-place.'

STAY, n. *stā* [Icel. and Dut. *stag*, the stay of a ship; Icel. *staga*, to bind, to fasten]: in a *ship*, strong rope extended from the head of a mast down to some part of the vessel to support the mast—the stays of a ship are distinguished by different names (see **RIGGING: SAIL**). **STAY-SAIL**, sail extended on a stay. **MAIN-STAY**, chief dependence. **TO MISS STAYS**, in *navigation*, to fail in tacking. **TO STAY A SHIP**, to put her about.

STAY—STEAD.

STAY, n. *stà* [Icel. *stöd*; Norw. *styd*, a stake, a support; Dut. *staede*; OF. *estaye*, a prop or supporter; Lang. *estaia*, residence]: continuance or abode in a place; a lingering; a prop or support; in *engin.*, a part in tension to hold parts together; in *OE.*, restraint; prudence; sobriety of judgment: V. to delay; to obstruct; to hinder from progression; to keep from departure; to repress; to remain or continue in a place; to wait; to forbear to act; to stop; to stand still; to wait for; to rely; to prop or hold up; to sustain with nourishment, as the stomach; to rest confidently on; in *OE.*, to give ceremonious or submissive attendance; to satisfy a strong desire. **STAYING**, imp. **STAYED**, pp. *stād*. **STAYS**, n. plu. *stāz*, a stout inner waistcoat, usually stiffened with whalebone, worn by females. **STAY-BOLT**, in *mech.*, a rod connecting opposite plates to prevent them being bulged out. **STAY-LACE**, a lace or string for fastening stays. **STAY-MAKER**, one whose occupation is to make stays.—**SYN.** of 'stay, v.': to continue; forbear; wait; attend; stop; dwell; withhold; repress; delay; obstruct; hinder; prop; support; restrain.

STEAD, n. *stēd* [Goth. *staths*; Dan. *sted*; O. Dut. *stede*, a place; Icel. *stadr*, a stead; Sw. *stadd*, situated, placed] place or room which another has or might have—preceded by *in*; denoting the replacing, or filling the place, of another; the frame of a bed, as *bedstead*; a place or locality, *homestead*: V. in *OE.*, to help; to support; to bestead; to fill the place of another. **STEADING**, or **STEDDING**, n. *stēd'ing* [Sw. *stadi*, standing in its place; *stadd*, situated]; in *Scot.*, a farmhouse and offices; a homestead. **TO STAND IN STEAD**, to stand in support or assistance; to be of advantage; to perform duties due from another. **TO STAND IN GOOD STEAD**, to render effectual assistance; to give good service or assistance.

STEAD, *stēd*, **WILLIAM THOMAS**: journalist: b. Embleton, England, 1849, July 5; son of a Congl. minister. He received a limited education; was a mercantile clerk for several years; became editor of *The Northern Echo* at Darlington, 1871; asst. editor of the *Pall Mall Gazette* (London) under John Morley, 1880; editor-in-chief on Morley's resignation 1883; and editor of the *Review of Reviews* (monthly), founded by him, 1890, Jan.; which has taken high rank among magazines, and has large circulation in the United States. Under his editorship the *Pall Mall Gazette* became the most notable and incisive of London newspapers in its uncompromising attacks on social immoralities; and S. was imprisoned six months for violations of law committed to expose nefarious practices toward women and children (see *The Maiden Tribute of Modern Babylon*, 1885). His exposures resulted in the passage of a long-needed amendment to the criminal law. S. is a strong advocate of the rights of workingmen. He published *No Reduction, No Rent: a Flea for the Plan of Campaign*, after visiting Ireland (1886); *The Truth about Russia*; *The Pope and the New Era* (1890); and *If Christ Came to Chicago*.

STEADFAST—STEAL.

STEADFAST, a. *stěd'fäst* [Sw. *stadig*, fixed, stable: Ger. *stätig*, continual: Icel. *stadfastr*, steadfast—from *stadr*, a stead; *fastr*, fast]: firm; constant; firmly fixed or established; resolute; not fickle. **STEAD'FASTLY**, ad. *-lǝ*. **STEAD'FASTNESS**, n. *-nēs*, firmness of mind or purpose; constancy; resolution.

STEADY, a. *stěd'ǝ* [from **STEAD**: Dan. *stadig*, steady]: not tottering or shaking; constant in mind or purpose; not fickle or changeable; regular; not fluctuating; uniform; of good conduct: V. to keep from tottering or falling; to make firm or steady; to support; to become steady. **STEAD'YING**, imp. *-ǝ-ing*. **STEAD'IED**, pp. *-ǝd*. **STEAD'ILY**, ad. *-ǝ-lǝ*. **STEAD'INESS**, n. *-nēs*, state of being not easily moved or shaken; firmness of mind or purpose; constancy.—**SYN.** of 'steadiness': resolution; immutability; unchangeableness; constancy;—of 'steady, a.': regular; undeviating; invariable; uniform; fixed; unremitting; stable; constant.

STEAK, n. *stāk* [Icel. *steikja*; Dan. *stege*, to roast, to fry: Icel. *steik*, a steak: Sw. *stek*, roast-meat]: a slice of beef, venison, etc., to fry or broil.

STEAL, v. *stēl* [Dut. *stelen*; Dan. *stjæle*; Goth. *stilan*; Icel. *stela*, to steal]: to take or carry away the property of another unlawfully; to take by theft; to practice theft; to pilfer (see **LARCENY**): to gain or win by gradual and imperceptible means; to slip away unperceived; to convey away or withdraw without notice. **STEAL'ING**, imp. **STOLE**, pt. *stōl*, did steal. **STOLEN**, pp. *stōl'n*: **ADJ.** carried away unlawfully and secretly. **STEAL'ER**, n. *-ér*, one who steals; a thief. **STEALTH**, n. *stēlth*, secret act; secret means employed to accomplish an object; a way not perceived; in *OE.*, the act of stealing. **STEALTH'Y**, a. *-ǝ*, done by stealth; unperceived. **STEALTH'ILY**, ad. *-ǝ-lǝ*. **STEALTH'FUL**, a. *-fúl*, given to stealth. **TO STEAL A MARCH**, to gain an advantage unobserved. **TO STEAL HEARTS**, to win or withdraw them from attachment or allegiance to others by various means. **BY STEALTH**, by secret act; clandestinely; with desire of concealment—often in a good sense.—**SYN.** of 'steal': to thief; pilfer; plunder; rob; filch; purloin.

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STEAM, n. *stēm* [AS. *steám*, vapor, smoke: Dut. *stoom*. vapor, steam]: the vapor of water produced by heating it to the boiling-point; the vapor of water employed as a motive power (see below): vapor in general: V. to apply steam to; to expose to steam; to give off vapor; to exhale; to evaporate; to progress, as a vessel by steam. **STEAM'ING**, imp.: ADJ. giving forth steam; being propelled by steam; rising in the form of steam. **STEAMED**, pp. *stēmd*: ADJ. exposed to steam; cooked or dressed by steam. **STEAM'ER**, n. *-ēr*, ship or boat propelled by steam; in *cooking*, a vessel used to steam articles. **STEAMBOAT**, **STEAM-PACKET**, **STEAMSHIP**, **STEAM-TUG**, **STEAM-VESSEL**, ships propelled by means of steam. **STEAM-HAMMER**, **STEAM-PLOW**, **STEAM-PRESS**, **STEAM-PUMP**, etc., implements or machines worked by steam. **STEAM-BOILER**, vessel for containing water to be generated into steam (see **STEAM**, below: **STEAM-ENGINE**). **STEAM-WHISTLE**, whistle attached to a steam-engine and sounded by steam.

STEAM: one of the three normal forms, solid, liquid, and gaseous, in which water exists: see **GAS**: **WATER**. There is a fourth state, Vapor (q.v.), which has some of the properties of both the gaseous and liquid forms, but which is properly steam condensed into fine globules which have not had time to coalesce and form a continuous liquid. Steam, or the gaseous form of water, is invisible: when it becomes visible it is by reason of the return of at least a part of it to the liquid form, in which it exists in a finely divided state.

So long as the surrounding air is not saturated with vapor at a maximum density corresponding to the temperature, steam is given off from water, snow, or ice at all temperatures at which we know them, its density and tension lessening as the temperature lowers. Thus, water at 32° Fahr. can give off vapor at a pressure of 0.085 lbs. per sq. inch into air that does not already contain watery vapor of that tension, when of course the two tensions will be balanced, and there will be no evaporation. Great density or tension of the air does not prevent or even lessen evaporation from water, snow, or ice. * But the presence of watery vapor at the maximum density or tension that the water can give off at the existing temperature will prevent it, no matter how low the density or tension of the atmosphere. The very fact that a vapor near the point of liquefaction has the power of retaining suspended in it a portion of its liquid in the state of cloud or mist, makes it difficult to determine just how much of the water or other fluid within a given volume is liquid, and how much gas or vapor.

Perfectly gaseous steam is composed of one cubic ft. of hydrogen and one-half cubic ft. of oxygen, collapsed into one cubic ft. of steam. Then, the ideal weight of one cubic ft. of steam, if supposed existing at 32° Fahr. under one atmosphere pressure, would be found thus:

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| | | | | |
|------------------------------|---|---|---|-------------------|
| 1 cubic ft. of hydrogen. | - | - | - | 0.005592 lbs. |
| One-half cubic ft. of oxygen | - | - | - | 0.044628 " |
| 1 cubic ft. of ideal steam, | - | - | - | <u>0.050220 "</u> |

This would give for the volume of one lb. of steam at atmospheric pressure at 32° Fahr., could it exist, 19.913 cubic ft. The work that would be in it at that volume would be $19.913 \times 2,116.3 = 42,141$ foot-pounds. At one atmosphere of pressure and a temperature of 212° Fahr., the volume would be 27.18 cubic ft., and the work 57,522 foot-pounds. The foregoing ideal figures are deduced from chemical composition, and assume a perfectly gaseous condition. As ordinarily computed, the volume of ideal steam at 32° and one atmosphere pressure is only 19.699 cubic ft. per lb., the weight of one cubic ft. being 0.05076 lbs., and the work that is in one lb. 56,907 foot-pounds. At pressures of one atmosphere and upward, the actual density of steam exceeds that above noted, on the assumption of a perfectly gaseous condition, the gases increasing with the pressure. The tables generally used give for a pressure of one atmosphere and a temperature of 212° Fahr. 26.36 cubic ft. per lb.; a weight of 0.03797 lbs. per cubic ft.; and work to the amount of 55,785 foot-pounds in one lb. weight of steam.

In the liquid state, water, like other substances, has such a condition of each internal particle that it tends to keep its volume constant; to resist change of volume, but not to resist change of figure. This latter peculiarity, the non-resistance to change of figure in liquid, is shared with gases; but in the fact that gases tend to increase their volume indefinitely, they are diametrically opposed.

Increase of temperature increases the resistance of a liquid to compression, and diminishes its cohesion: see HEAT. For water, like most (if not all) liquids, there is for each temperature a maximum pressure on its external surface, which is necessary to keep it liquid. Addition of heat to its mass causes it to emit bubbles of vapor from its external surface. Water, like all liquids, under all circumstances, is believed to emit vapor from its surface, and to be surrounded with an atmosphere of its own vapor. When water or any other substance is in a vaporous condition, it is properly at the maximum density consistent with that condition.

The pressure of steam, or any other vapor, increases with the temperature at a rate which itself increases rapidly with the temperature. The pressure against the interior surface of a vessel by a given quantity of perfect gas within it, is the sum of all the pressures which any number of parts into which it might be divided would exert separately, if that part were in the same vessel alone and at the same temperature; and this same law is applicable to mixtures of gases; so that if 0.03797 lb. of steam at 212° Fahr. in a vessel having a volume of one cubic ft. exerts a pressure of one atmosphere, and if 0.080728 lb. of air in a volume of one cubic

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ft. at a temperature of 212° Fahr. exerts a pressure of 1.365 atmospheres, a mixture of the two will exert a pressure of 2.365 atmospheres.

Boiling, or the giving out of vapor bubbles from the surface of a liquid, is caused by the continuous communication of heat to the liquid mass, and the continuous removal of the vapor so as to keep the pressure of the liquid through its mass at a point not greater than that of saturation for its temperature. When the term boiling-point is used, it means the boiling-point under the average atmospheric pressure of 14.7 lbs. per sq. inch.

The presence of a dissolved substance, e.g., salt, in water, resists its tendency to boiling and raises its boiling-point under a given pressure; but if the dissolved salt or other substance does not evaporate with the water, it will cause no change in the relation between the temperature and the pressure of saturation of the vapor. Average sea water contains about $\frac{1}{32}$ of its weight of salt, and every successive $\frac{1}{32}$ that water contains raises the boiling-point about 1.2° Fahr. Water saturated with brine boils at 226° Fahr.

Vapor of a temperature above the boiling-point corresponding to its pressure, is brought into the condition of a permanent gas, and is said to be superheated.

In passing from the liquid state into steam, the temperature of water remains at the boiling-point, which is determined by the pressure of the vapor produced. To make the evaporation continuous, a certain quantity of heat must be added to the water or to the steam for each unit of weight of steam formed. That heat does not raise the temperature of the water nor of the steam, but disappears, being used in keeping the water in the gaseous state; and the amount so used without being perceived as heat, is called the *latent heat of evaporation*: see HEAT. Conversely, while steam, or any other gaseous substance or vapor, passes into the liquid state, its temperature remains stationary at the boiling-point (or condensing point, which is the same thing) corresponding to its pressure; and a quantity of heat equal to the latent heat of evaporation at that temperature is produced in it. In order that condensation may continue, the heat must be transferred from the water (or other liquid) to some other body.

The boiling of water or other liquid will be retarded by its being in a vessel which is of a material which attracts the liquid. This will cause the boiling to take place by starts instead of regularly.

The latent heat of evaporation of one lb. of water is, according to Regnault, 966.1 British units when the pressure is one atmosphere of 14.7 lbs. per sq. inch. The total heat of evaporation of water is the amount required to evaporate one lb. at a given temperature (the latent heat of evaporation), plus the amount required to raise it from some given temperature to that of evaporation (the sensible heat). The total heat of

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steam from the temperature of melting ice has been proved by Regnault to increase at a uniform rate as the evaporation temperature rises.

If a certain volume of steam be in a closed vessel, and kept at constant temperature, and the pressure on it be increased by mechanical means, the increase of pressure will liquefy part of it, leaving the remainder at the same temperature as before. In this it widely differs from air, which, subjected to the same treatment, will have the density of all parts of it equally increased. We ordinarily apply the term steam to that vapor which rises from water heated to 212° in an open vessel; but there is no essential difference between steam at 212° and steam at 60° , except in the amount of heat that they contain. It may be asked, what becomes of the heat that is made latent in the evaporation of water? It may be said to be used in forcing apart the molecules of water or steam. It cannot be manifested both as heat and as work. If the steam does further work in driving a piston in a cylinder, it loses some of its heat, and its particles cannot be maintained at the same distance apart or at the same tension. In every investigation concerning steam, and in almost every calculation relating thereto, it is well to remember that all pressures should be counted from an absolute zero, or from that of a perfect vacuum, and such as would exist if the space were not filled with atmospheric air; and that this zero point is about 14.7 lbs. per sq. inch below the pressure of the atmospheric pressure; or, to put it more properly, the zero being a fixed point and the atmospheric pressure being variable with the height above the sea-level and with meteorological conditions, the atmospheric pressure is about 14.7 lbs. per sq. inch above absolute zero. That steam which is liberated from the surface of water in an open vessel at the sea-level has really a pressure of 14.7 lbs. per sq. inch, because it is just able to balance the tension of the atmosphere; but in ordinary gauges it is said to be of no pressure at all, because for purposes of work it has none available to drive a piston or otherwise do mechanical work. Steam produced in a confined volume in a closed vessel will have a tension of more than 14.7 lbs. per sq. inch above absolute zero of pressure, the pressure being nearly inversely as the volume. That is, a cubic inch of water made into steam in the open air at the sea-level will take up about 1,645 cubic inches, or nearly a cubic ft. That which is made from one cubic inch of water in a closed vessel having a capacity of 1,646 cubic inches, and containing, besides the cubic inch of water, 1,645 cubic inches of air at one atmosphere pressure, will have a pressure of about two atmospheres, which will be 14.7 lbs. per sq. inch above atmosphere ('by the gauge'), or 29.4 lbs. absolute. This nearly inverse relation between the pressure and the volume of steam is very nearly the same for all pressures and volumes, particularly for those within the range within which we know and use steam;

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and enables us quite readily to compute the pressure of steam which is expanding in a cylinder, after being cut off from communication with the boiler: see EXPANSION: STEAM-ENGINE.

When water is boiled in an open vessel and has exerted against it no pressure except that of the atmosphere (14.7 lbs. per sq. inch), its temperature can never rise above 212° Fahr.; nor can that of the steam produced from it. Increase of heat simply increases the quantity of water evaporated, or the rate of evaporation. But if the evaporation be conducted in a closed vessel, the temperature of both the water and the steam can be increased to any degree. If such evaporation were conducted in a vertical cylinder having a piston fitting steam-tight, it would be found that increase of temperature would increase the tension of the steam so that it would raise the piston; and in order to hold down the latter there would have to be applied a weight or pressure. At that point where the weight or pressure applied to hold down the piston was 14.7 lbs. per sq. inch of its area (including the weight of the piston itself), and at which point the steam would have a pressure of 14.7 lbs. per sq. inch by the gauge, or 29.4 lbs. absolute, it would be found that both the water and the steam in the cylinder had a temperature of about 250° Fahr. When by reason of continued application of heat the force required to hold down the piston becomes 29.4 lbs. per sq. inch of its area, at which the steam would have a pressure of 44.1 lbs. absolute, the temperature of water and steam would be about 273° Fahr. If instead of continuing to weight the piston until there was 29.4 lbs. per sq. inch on it, it had been allowed to rise with the increasing pressure, the continuous application of heat would only have caused the evaporation of an increased amount of water at a temperature of 250° and a pressure of 14.7 lbs. by the gauge, or 29.4 lbs. absolute.

At a temperature of 300° Fahr. the pressure of the steam should be 67 lbs. absolute; at 350°, 136 lbs.; at 400°, about 250 lbs. This increase in the ratio between the pressure and the temperature increases, so that we find that doubling the temperature increases the pressure nearly 23 times. This fact shows two things: first, that it is dangerous to continue to apply heat to a boiler or other vessel containing water, without allowing full escape for the steam; secondly, that, other things being equal, it is economical to use steam at high pressures rather than low, because the high pressures take comparatively less heat.

These facts concerning the temperature and pressure of steam refer to it only as long as it is in contact with water. The addition of heat while it is in contact with water causes additional steam generation without any rise in temperature. But steam heated away from contact with water may have its temperature raised without increase in pressure.

Steam generated in contact with water, but contain-

ing no water mechanically mixed therewith, is said to be saturated; its temperature being only that due to its pressure. That which is heated away from contact with water, and which has its temperature raised above that corresponding to its pressure, is said to be superheated. That which is used for purposes of power generation is very seldom superheated. Saturated steam, which is that used for almost every purpose in the industrial arts, differs greatly from a perfect gas in the relation between its pressure and volume. If the pressure be given in lbs. per sq. inch, and the volume in cubic ft., the product of the two, that is, the foot-pounds of work that are in it, will be expressed by the formula,

$$\log. pv. = 4.675 + .061 \log. p.,$$

i.e., the logarithm of the number of foot-pounds in any given quantity will be equal to 4.675 plus .061 times the logarithm of the pressure.—See STEAM-ENGINE.

STEAM-CARRIAGE: vehicle propelled on a common road by steam. The first to suggest the application of the power of steam to propulsion of a land vehicle seems to have been Isaac Newton, who 1680 sketched the scientific toy described in explanation of the Newtonian philosophy. It is on the same plan as Hero's *Æolipile*, there being a spherical boiler (in this case mounted on wheels) with a jet which projects to the rear and is controlled by a handle managed by the driver. The reaction is supposed to drive the carriage ahead. In 1759 Dr. Robison proposed to Watt to apply steam to propulsion of a road vehicle. In 1765 Erasmus Darwin urged Boulton, then Watt's partner, and at that time corresponding with Franklin concerning steam power, to build a 'Fiery Chariot,' the plan of which he sketched. In 1790 Nathan Read planned and patented a S.-C., of which he made a model, and in which the axles were turned by ratchets on the piston rods; and the exhaust pipes were turned backward to utilize the back pressure in propelling the carriage forward. In 1769 Cugnot built and ran a S.-C.; and 1770 another with a single driving-wheel in front of a strong timber frame, and two stout trailing wheels. Two vertical engines of 13-inch bore, supplied by an insufficient boiler in front of the driving-wheel, turned the axles by a ratchet and pulley arrangement, which could be reversed to run the carriage backward.

The early history of the S.-C. is largely interwoven with that of the locomotive. Watt, 1784, proposed to apply his own engine to locomotion; this requiring either a non-condensing engine or an air surface condenser. In 1786 an American inventor, Oliver Evans (q.v.) applied for a patent to use the steam-engine for vehicles, but was refused by the Pennsylvania legislature. In 1800 or 1801, he commenced applying the non-condensing engine to a S.-C., but changed his plans, and turned his attention to mill driving by steam power.

STEAM-CARRIAGE.

Later he reverted to the idea of steam locomotion, and wrote: 'I have no doubt that my engine will propel boats against the current of the Mississippi, and wagons on turnpike roads, with great profit. . . . The time will come when people will travel in stages moved by steam-engines from one city to another, almost as fast as birds can fly, 15 or 20 miles an hour. . . . A carriage will start from Washington in the morning, and passengers will breakfast at Baltimore, dine at Philadelphia, and sup in New York the same day. . . . Engines will drive boats 10 or 12 miles an hour, and there will be hundreds of steamers running on the Mississippi, as predicted years ago.' In 1804 he built a dredging-machine which weighed about 40,000 lbs., and which consisted of a flat-bottomed scow, having a stern paddle-wheel, and mounted on four wheels so that it could be run on land—the first steam locomotive in America. It was propelled about the streets of Philadelphia by its own engines, launched in the Schuylkill river, and propelled down that stream into the Delaware.

In England there were many experiments in this line. Trevithick, 1802, made a model S.-C. (now in the Patent Museum at South Kensington) with a high-pressure non-condensing single-cylinder engine, whose piston drove a crosstail working in guides, and connected with a crosshead on the opposite side of the shaft by two side rods; being in fact the first 'return connecting-rod' engine. It was geared to the axles of the carriage; and the wheels were to be kept from slipping by driving bolts through their rims into the ground.—In 1821 James Griffiths patented, and Joseph Bramah built, a road locomotive having a large double coach-body between its two axles, and its machinery over and back of the rear axle. The boiler had horizontal water tubes and steam tubes, and the wheels were driven through gearing by two steam-engines suspended on springs. There was an air surface condenser, and the water of condensation was returned to the boiler, which latter, however, was not large enough.—In 1804 David Gordon re-patented Burnton's idea of 1792, which also had been preceded by Gurney, and occasionally appears now as a new invention—the use of jointed legs to imitate the action of the legs and feet of horses. Other inventors made various experiments.

In 1827 Gurney built a S.-C. which ran regularly in the neighborhood of London for two years, on one occasion going 85 m. in 10 hours. This carriage had the mechanical legs and feet, which he afterward abandoned. In 1828 he produced one with a sectional boiler in the rear, and two horizontal reversible, link-motion engines, cutting off at half stroke, a little in advance of the centre. There was a blast apparatus driven by a separate engine. The feed water was heated, and the steam superheated.—In 1827 Hancock made steam carriages having 'sheet flue' boilers, and three wheels, the leading one swivelling on the king bolt; the motive power being two

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oscillating cylinders connecting with a cranked axle. In 1831 he ran a S.-C. regularly for hire between London and Stratford; and in the same year Dana ran one between Cheltenham and Gloucester, 9 m.; making the trip in 45 to 55 minutes; and carrying 3,000 passengers, and running 3,500 m. between Feb. 21 and June 22. Ogle & Summers, about this time, are reported to have run one at high speed, with 250 lbs. of steam. In 1833 Macerone ran a steam-carriage of his own design from London to Windsor and back, with 11 passengers, 23½ m. in two hours. In the same year Dana ran his carriage 16 m. an hour; making long excursions at the rate of 9 m.; and Heaton towed a coach and 20 passengers up Lickey Hill between Worcester and Birmingham, on one of the worst roads in the country, up a gradient of one in eight to one in nine.

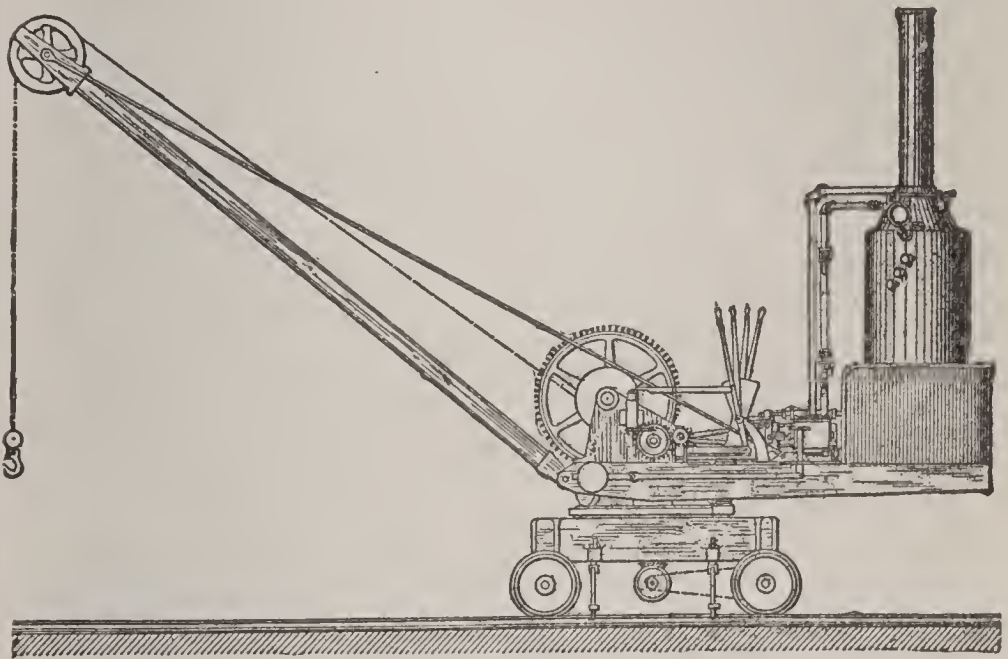
Hancock's steam coach 'Infant,' built 1831, was in 1832 plying between London 'City' and Paddington. His 'Era' was a success mechanically, though the company for which it was built was not commercially. The 'Infant' ran, 1832, Oct., from London to Brighton, with 11 passengers, 9 m. per hour; ascending Redhill at the rate of 5 m. His 'Autopsy' of 1833, ran from London to Brighton, and all about the crowded streets of London; then regularly between Finsbury Square and Pentonbury. This had both the engines and the boiler vertical—the latter in the rear, and having a forced draught from a blower, the former rather to the rear of the centre, and driving the rear axles by chain gearing.—In 1834 Hancock built for an Austrian company a steam 'drag,' which carried 10 passengers, and towed a coach with six more, making 14 m. an hour on the level and 8 on rising ground. In 1835 his 'Erin' was built, to carry 20 passengers. It towed three omnibuses and a stage-coach, with 50 passengers, on a level road, 10 m. an hour; and towed an omnibus with 18 passengers 14 m. an hour. Later it ran 75 m. to Marlborough, in 7½ hours running time, stopping 4½ hours on the road by reason of having left its tender and supplies. From 1836, May, he ran his carriages regularly on the Paddington Road five months, making 712 trips, in all 4,200 m.—the daily run being about 5¼ hours. In 1838 he built for his own use a light steam phaeton, which made 20 m. an hour when desired. In all he built nine steam carriages, which could carry a total of 116 passengers besides their attendants.—1833, Dec., there were 20 steam-carriages and traction road-engines running or under construction in and about London; but the determined opposition of the stage-coach interest largely caused their commercial defeat.

In the United States, the condition of the ordinary roads and streets in the first half of the 19th c., and till the present day, has prevented successful experiments; and the development of railways has precluded the attempt to use road-engines for traffic between towns.—See TRACTION-ENGINE.

STEAM-CRANE.

STEAM-CRANE: machine for raising and lowering weights, and for moving them horizontally, in either a rotary or a rectilinear direction—the power being given by a steam-engine attached to the crane itself, whether the steam be generated in a boiler attached, or be carried to the crane by pipes from a fixed source.

Of the rotary type there may be these varieties: swing, which have rotation, but no travel to and from the vertical center of motion; jib, which have rotation or swinging motion and in addition a trolley by which the load may be moved in and out from the centre; column, practically the same type as a jib, except that the centre is a fixed column, which may support a floor above; pillar, having rotation only, and the head of the pillar of which is unsupported; walking—that is, of the pillar or jib type, but mounted on wheels and travelling on a truck; locomotive, or of the pillar type, but mounted on a truck and having a steam-engine and boiler for hoisting and lowering the load, and swinging it, and for propelling the machine as a whole.



Steam-crane.

Of rectilinear cranes there are: bridge, which have a fixed bridge spanning an opening, and a trolley which supports the load and moves along the bridge; tram, formed of a short bridge moving lengthwise on overhead rails and having no trolley motion; travelling, consisting of a bridge moving lengthwise on overhead tracks and having a trolley moving along the bridge; gantries, which consist of an overhead bridge carried at each end by a trestle which travels upon a track on the ground—the bridge having a trolley; rotary-bridge, having both swing and lengthwise motion, and consisting of a bridge pivoted at one end to a central pier and supported at the other on a circular track—the bridge having a trolley moving crosswise thereon.—The locomotive and gantry types are necessarily steam-cranes; the others may be worked by other power,

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as by hand, hydraulic pressure, compressed air, or electricity.

Locomotive cranes are really of more general use than any of the other types, as they can pick up and swing a load as an ordinary jib crane can, and at the same time walk and travel therewith on the length of track available. By slight and inexpensive alterations they may be used temporarily as fixed or docked cranes, as steam hoisting-engines, and winding-engines, for pile-driving, and for train service. The cut shows a locomotive crane which hoists, rotates, and travels by steam: as shown, there are anchoring or gripping clamps from the car or platform to the rolls, for use when hoisting heavy loads.

STEAM-ENGINE: machine comprised in that division of machines which convert heat, as that of combustion, into work. See **HEAT: STEAM: CALORIC ENGINE: BOILER: WORK.** In very early days, nearly 200 years ago, they were more properly called fire-engines, thus recognizing that the steam is but a medium by which the work that is in the heat is carried and applied in convenient form. The first steam-engines (or fire-engines, as they were then called) used steam only at atmospheric pressure, to do the mechanical work of forcing the atmosphere from a vessel, in which a spray of water then condensed the steam back into water. The atmosphere pressing upon the surface of a body of water caused the latter to refill the vessel, or acting upon a piston caused it to descend, doing work by hauling on one end of a beam, the other end of which caused the working stroke of a deep mine-pump. The measure of the gross work done, including friction, was the difference between the atmospheric pressure of 14.7 lbs. per sq. inch, and the pressure remaining in the working vessel, due to the temperature therein. Such devices were called atmospheric engines.

Long prior to this (B.C. 130) was Hero's *Æolipile* (see **HERO**), a globe mounted on hollow trunnions through which steam passed, and having, 90° from these, two radial tubes furnished with jets at right angles to themselves and the trunnions, this globe being made to rotate by the reaction of the steam against the atmosphere. Although it may have been made to do light work by attaching a driving-pulley to one of the trunnions, it remained practically a scientific toy.

Though the invention of steam as a motive-power is claimed by various nations, its first extensive employment, and most of the improvements of the steam-engine, the world owes to the English and the Americans. As early as 1543, a Spanish capt., Blasco de Garay, showed in Barcelona harbor a steamboat of his invention, probably on the principle of the *Æolipile* of Hero. The German engineer De Caus describes, in *Les Raisons des Forces Mou-vantes avec Diverses Machines* (Frankf. 1615), a steam-machine for forcing the water contained in a copper ball through a tube, by applying heat. An Italian engineer, Branca, invented, 1629, a steam-wheel; the steam being generated in a boiler, and directed by a spout against flat vanes, thus setting the wheel in motion.

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In England one of the first notices of the idea of employing steam as a propelling force is in a small volume, *The Art of Gunnery* (1697), by Nat. Nye, mathematician; in which he proposes to apply it in discharging ordnance. But the first successful effort was that of the Marquis of Worcester. In his *Century of Inventions*, the manuscript of which dates from 1655, he describes a steam-apparatus by which he raised water 40 ft.: this, under the name 'Fire-waterwork,' appears to have been in use at Vauxhall in 1656. Sir Samuel Morland, 1683, submitted to Louis XIV. a project for raising water by steam, accompanying it with ingenious calculations and tables. The first patent for applying steam-power to various kinds of machines was taken out in 1698 by Capt. Savery. In 1699 he exhibited before the Royal Soc. a working model. His engines were the first used to any extent: they seem to have been employed for some years in mine drainage in Cornwall and Devonshire. Their essential improvement over the older ones was the use of a boiler separate from the vessel in which the steam did its work.

The first so-called 'fire-engines' (of Capt. Thomas Savery, 1698—see his *Life*) were pistonless water-elevating machines much similar in principle to the 'pulsometer' of the present day, operating on machinery. Steam (at a low pressure) entered an egg-shaped chamber full of water, part of which it drove out, becoming itself condensed, thus forming a vacuum which was filled by the rush of more water from the source of supply, which in turn was driven out by a fresh volume of steam. Suitable check-valves controlled the inlet or outlet of the water, and the steam admission was controlled by an ordinary cock.

In all attempts at pumping-engines before 1690, including Savery's, the steam acted directly on the water to be moved. To Dr. Papin (q.v.), a Frenchman, is due the idea of the *piston*, 1690.

The atmospheric engine (Newcomen, Savery, and Cawley, about 1705) was a great step in advance: it was largely applied in mines, holding its place for nearly 70 years. It was a single-acting pumping-engine with a piston which drove no rotating piece, but confined its work to raising a heavy piston-rod; gravity causing the return stroke. The condensation by which the atmospheric pressure (see ATMOSPHERE) was enabled to exert its downward pressure upon the piston was effected in the working cylinder itself, which naturally remained too cold for proper steam admission permitting piston elevation, yet too warm for rapid and thorough condensation. Making the condenser a separate vessel in connection with the lower end of the working or piston cylinder permitted great advance: see WATT, JAMES. A further step was making the cylinder double-acting, thus doubling its capacity, and properly permitting the application of the machine to turning machinery instead of only to raising a pump rod. The use of an air-pump to withdraw from the condenser both the condensed steam and the mixed steam and air, and surrounding the cylinder with a steam-jacket or with a non-

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conducting lagging (see HEAT: NON-CONDUCTOR), were improvements by James Watt (q.v.), with which began (1769) a new era in the history of the steam-engine. The principal improvements since his day have been in enlarged applications of his principles, and in the multitudinous details of construction.

The general principle of the modern steam-engine will perhaps be better understood from theoretical engines, beginning with the most simple, and gradually adding features which have proved important.

The first which we may imagine has but one cylinder, which we will suppose to be vertical and closed at only one end, to have a bore of 100 sq. inches area, fitted steam-tight with a freely-moving piston, and to be supplied with one simple cock to admit steam from a boiler, say of 40 lbs. pressure by the gauge, and another cock to permit it to exhaust into the open air. In pressing up the piston with an effective force equal to 40 lbs. per sq. inch by the ordinary gauge, or, disregarding fractions, of $40 \times 100 = 4,000$ lbs., this steam has really a pressure of 54·7 lbs. per sq. inch; but it must overcome the atmospheric pressure of 14·7 lbs. per sq. inch either in blowing off from the safety-valve or in driving a piston; so the gauge is graduated to show its net pressure, or pressure above atmosphere. If the exhaust-valve is opened to permit the weight of the piston to bring it to its original position, this single-acting, single-cylinder engine will have made but one working stroke. If the piston have a stroke of one ft. the gross work done in driving it to the end of its stroke will be 4,000 foot-pounds. If the stroke take a minute to accomplish, the engine will have a power of $\frac{4}{33}$ horse. If it makes 33 such strokes in four minutes, it will have one horse-power (see BOILER), because it will be doing 132,000 foot-pounds of work in four minutes, or 33,000 in one minute.*

The amount of steam used would be a whole cylinderful of 1,200 cubic inches, at a pressure of 40 lbs. per sq. inch by the gauge, or 54·7 lbs. above zero. If, instead of permitting steam to enter from the Boiler (q.v.) during the entire stroke, the admission-valve was closed at half-stroke, there would be used a half-cylinderful or 600 cubic inches during that stroke; but the steam would tend to expand, decreasing in pressure about in the same proportion as it increased in volume, until it had forced the piston to the end of the cylinder, where the half-cylinderful, or 600 cubic inches at a pressure of 54·7 lbs. absolute,† would have a bulk of one cylinderful or 1,200 cubic inches, whose pressure would be $54\cdot7 \div 2 = 27\cdot35$ lbs. per sq. inch above vacuum. If the eduction-valve (exhaust-valve) were then opened, this steam would escape or exhaust against the atmospheric pressure of 14·7 pounds per sq.

* In all these typical engines it is supposed that the steam does not lose either temperature or pressure by condensation, friction, or other cause, and that the engine is frictionless.

† Absolute pressure is pressure above vacuum or above absolute zero of pressure, hence 14·7 lbs. per sq. inch less than that of the atmosphere.

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inch. The work that it had done during the time when it had full boiler-pressure would be $4,000 \times \frac{1}{2} = 2,000$ foot-pounds. The pressure that it exerted while expanding and not in connection with the boiler would have constantly decreased in regular order, about as follows (see STEAM):

| Point of stroke, inches. | Volume, cu. in. | Proportionate pressure. | Absolute pressure, lbs. per sq. in. | Gauge pressure, lbs. per sq. in. |
|--|-----------------|-------------------------|-------------------------------------|----------------------------------|
| 6 | 600 | 1 | 54.7 | 40.0 |
| 7 | 700 | $\frac{3}{4}$ | 46.89 | 32.19 |
| 8 | 800 | $\frac{2}{3}$ | 41.03 | 26.33 |
| 9 | 900 | $\frac{3}{5}$ | 36.47 | 21.77 |
| 10 | 1,000 | $\frac{2}{5}$ | 32.82 | 18.12 |
| 11 | 1,100 | $\frac{1}{5}$ | 29.75 | 15.05 |
| 12 | 1,200 | $\frac{1}{6}$ | 27.35 | 12.65 |
| Average total pressure after cut-off * | | | 35.72 | 21.02 |
| Atmospheric pressure | | | 14.7 | |
| Average gauge-pressure after cut off | | | | 21.02 |

This average pressure of 21.02 lbs. per sq. inch upon the piston area of 100 sq. inches would exert a pressure of 2,102 lbs. and, as it propelled the piston 0.5 ft., would represent 1,056 foot-pounds, the work done by the half-cylinderful of steam during expansion. Added to the 2,000 foot-pounds done before cut-off, it gives 3,056 foot-pounds of work done by a half-cylinderful of steam, with cut-off at one-half. Using steam clear to the end of the stroke gives 4,000 foot-pounds of work for a whole cylinderful, or only 2,000 for a half-cylinderful; so that in theory we have a gain of $\frac{3056-2000}{2000} = \frac{1065}{2000}$, or 52.8 per cent. by cut-off at one-half stroke. Cutting off at quarter stroke instead of at one-half, we have, supposing perfect expansion, the following approximate pressures above zero:

| Stroke, inches. | Volume, cu. in. | Proportionate pressure. | Absolute pressure, lbs. per sq. in. |
|---|-----------------|-------------------------|-------------------------------------|
| 3 | 300 | 1 | 54.7 |
| 4 | 400 | $\frac{3}{4}$ | 41.0 |
| 5 | 500 | $\frac{2}{3}$ | 32.82 |
| 6 | 600 | $\frac{3}{5}$ | 27.35 |
| 7 | 700 | $\frac{2}{5}$ | 23.44 |
| 8 | 800 | $\frac{1}{5}$ | 20.51 |
| 9 | 900 | $\frac{3}{8}$ | 18.23 |
| 10 | 1,000 | $\frac{1}{4}$ | 16.41 |
| 11 | 1,100 | $\frac{3}{11}$ | 14.92 |
| 12 | 1,200 | $\frac{1}{2}$ | 13.67 |
| Average total pressure during expansion | | | 23.155† |
| Less pressure of the atmosphere | | | 14.7 |
| Average gauge-pressure during expansion | | | 8.45 lbs. |

Here we have the work done during the period of full steam $40 \times 100 \times 0.25 = 1,000$ foot-pounds; that done during expansion is $8.45 \times 100 \times 0.75 = 634$ foot-pounds; total

* This average is only approximate, being the mean of the pressure at too few points: the correct mean pressure during expansion may be found by the use of hyperbolic logarithms.
† This is only approximation: it would be nearer if there were more points taken. The actual average pressure during expansion may be calculated by the use of hyperbolic logarithms.

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work done during the full stroke 1,634 foot-pounds, with cut-off at $\frac{1}{4}$; that is, with a quarter-cylinderful of steam. As the work done by a quarter-cylinderful of steam without expansion would be only 1,000 foot-pounds, we have an increase of 63·4 per cent. in the work done. In practice it is found that with a single cylinder expansion can seldom be profitably carried on through more than $\frac{4}{5}$ of the stroke (cutting off at $\frac{1}{5}$).

A further development of such an engine would be to make it double-acting, i.e., to let each end serve alternately for working pressure and for exhaust. As the pressure throughout the stroke of such an engine would vary, increased steadiness would be gained by having two or more cylinders acting on cranks at equal distances about a shaft. A further development would be to enable the steam to exhaust into a vacuum instead of against the atmospheric pressure of 14·7 lbs. per sq. inch. This can be effected by condensing the exhaust by a spray of cold water, preferably in a closed vessel; forming what is known as a jet-condenser. If the condensation of the steam were perfect, there would be, to oppose the exhaust of the steam, only the tension due to the vapor from the water at the temperature of that water after it had cooled the exhaust steam and been heated and added to thereby. On the supposition of no tension, we have in the case of the same hypothetical engine, with no cut-off, a pressure of 54·7 lbs. per sq. inch on the piston, which would be 5,470 lbs. pressure on the piston; and working through 1 ft. each single stroke, we have 5,470 foot-pounds, instead of 4,000, as the maximum theoretical work done by one cylinderful of steam. In fact, by perfect condensation we add 1,470 foot-pounds to whatever work the engine does. Thus we have the following theoretical maximum gains by condensation for no cut-off and for cut-offs at half-stroke and quarter-stroke respectively:

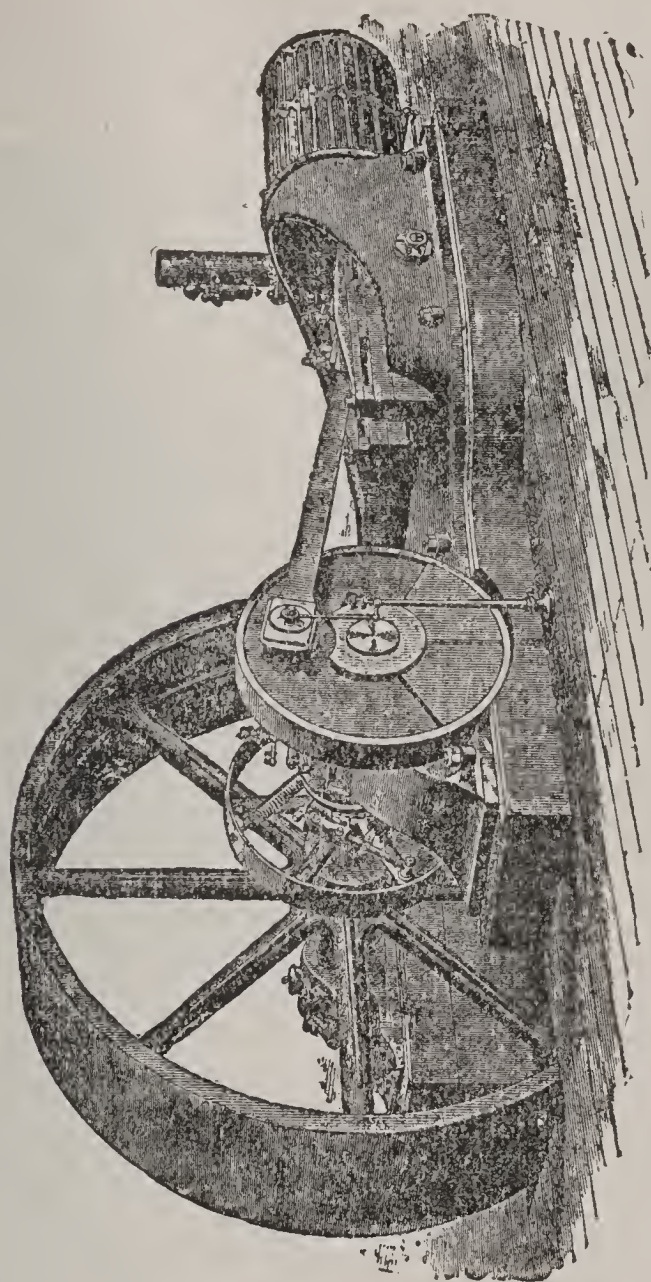
| Period of expansion. | Work before expansion or condensation. | Work during expansion. | Total work before condensation. | Work during condensation. | Total work. | Gain by condensing. |
|----------------------|--|------------------------|---------------------------------|---------------------------|-------------|---------------------|
| Stroke. | ft.-lbs. | ft.-lbs. | ft.-lbs. | ft.-lbs. | ft.-lbs. | |
| 0 | 4,000 | 0 | 4,000 | 1,470 | 5,470 | 36·75 |
| $\frac{1}{2}$ | 2,000 | 1,056 | 3,056 | 1,470 | 4,526 | 48·10 |
| $\frac{3}{4}$ | 1,000 | 634 | 1,634 | 1,470 | 3,104 | 89·9 |

The jet-condenser had the disadvantage of mingling the water of condensation with that which is to be fed with the boiler. This may be avoided by condensing the exhaust steam in contact with one side of metallic surfaces, as tubes, whose other side is in contact with a current of cold water. An apparatus on this principle is known as a surface-condenser. It is most usual to pass the water through the tubes, and the steam into the case around them; though in the British navy the reverse is the usage, for the purpose of lessening the heating effect of the condenser on the engine-room. Where there is considerable flow of water, a very simple device, known as a siphon-

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condenser, is used: in it the exhaust steam and the condensing-water are in concentric jets, and the nozzles are of such shape as to give the greatest possible contact-surface between the two fluids.

In practice the principle of using steam expansively in a single cylinder cannot be carried much further than to cutting off at $\frac{1}{8}$, because of the difficulties (1) of cutting off



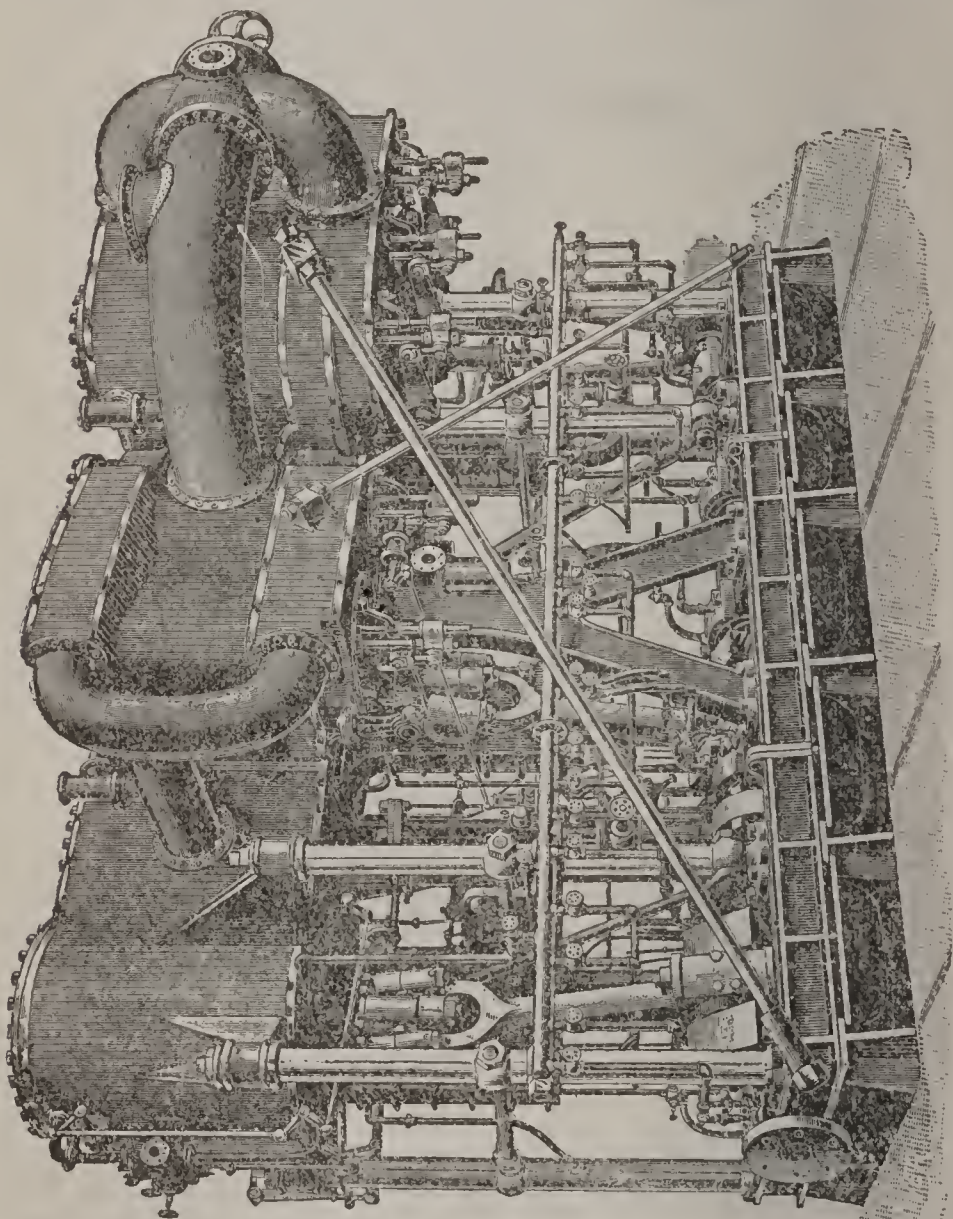
Tangye Bed Horizontal Engine.

so early with an ordinary slide-valve without choking the exhaust and opposing to the advancing piston a back pressure which would have to be subtracted from the pressure on the working side; (2) of the cooling of the cylinder walls during expansion in one single stroke causing condensation of the incoming steam for the next single stroke; and (3) of using the same ports and passages for comparatively cold exhaust steam and hot new steam, which chills the latter—thus causing a loss of temperature and pressure

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consequently of efficiency; (4) of the greatly varying pressures on the crank-pins during a complete stroke.

For this reason, just as it was found desirable to cause the condensation of the exhaust in a vessel separate from the working cylinder, it has been seen to be advantageous to have high grades of expansion conducted in a separate cylinder into which the exhaust of the first one is conducted, instead of into the atmosphere or into a condenser. The exhaust of this cylinder may be permitted to escape into the open air against the atmospheric pressure or led into a condenser where that pressure will be removed. To effect this work of expanding in two successive cylinders (or compounding, as it is called), the first or



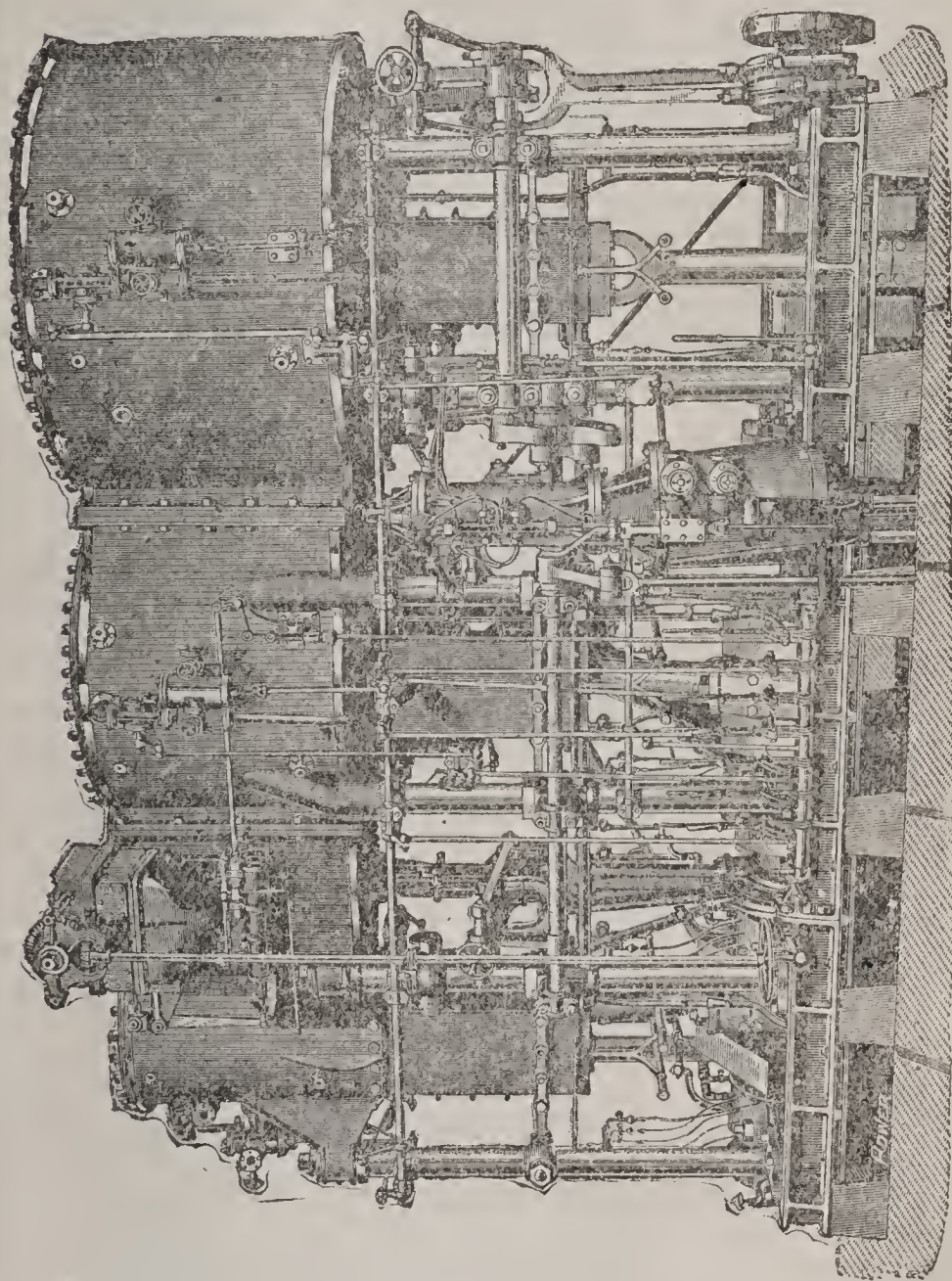
Triple Expansion Engines, U. S. Cruiser *Maine*: 4,500 H.P. each set.—(From *Power*.)

high-pressure cylinder has a smaller volume than the second or low-pressure cylinder; the ratio between the two being preferably such as will about divide between them the work done. In such a compound engine, the low-pressure cylinder (with its condenser, if there is one) is practi-

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cally the measure of the work done by the entire engine, at a given degree of expansion, counting from the admission-pressure in the small or high-pressure cylinder to the terminal or exhaust pressure in the large or low-pressure cylinder. Its expansion in the high-pressure cylinder instead of in the low is merely a convenience to save shock on the mechanism, and to lessen the loss by cooling against the cylinder walls and in the cylinder passages.

Compounding may be effected by dividing the exhaust from one high-pressure cylinder between two low-pressure cylinders, or by exhausting from two high-pressure cyl-



Working Side, Triple Expansion Engines, U. S. Cruiser *Maine*:
4,500 H.P. each set.—(From *Power*.)

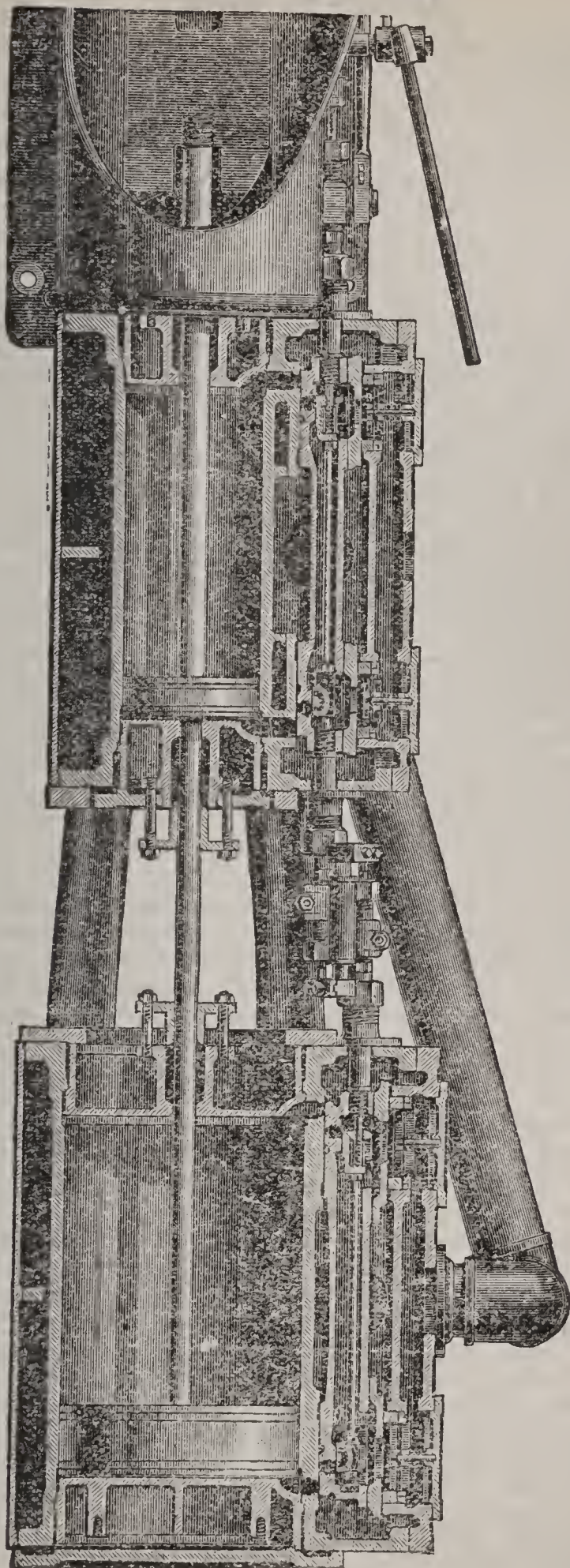
inders into one low; the effect of having more cylinders for a given degree of expansion in two stages being to equalize the strains and lessen the shocks on the machinery, while increasing the cost of the machinery and the amount of internal cylinder condensation.

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A further development of compounding in two successive stages is what is known as triple expansion, in which there are three successive stages of expansion done in three or more cylinders. Usually there is one small or high-pressure cylinder, receiving steam direct from the boiler, and exhausting into an intermediate one of larger size, which in turn exhausts into a third or low-pressure cylinder of still larger volume. Either the first, the second, or the third stage of expansion may be effected in more than one cylinder; the principle is the same. It is triple expansion if there are three stages effected in three cylinders or sets of cylinders. Triple expansion enables and requires higher initial pressure than compounding, in order to make it economical and desirable.

Carrying still further the same principle of separating in successive cylinders, we have what is known as quadruple expansion. The greatest simplicity of construction to effect this calls for four cylinders of successively increasing capacities; but any of the stages may be conducted in either one or more cylinders. In quadruple expansion the cylinders receive the name of high-pressure, first and second intermediate, and low-pressure; and there may be one, two, or more of these, all in the same system. Quadruple or 'four-stage' expansion enables and requires higher initial pressure than triple expansion, and is only just now (1891) coming into understanding and use; engines of this type being, with a very few exceptions, confined to marine service.

The two-cylinder compound engine may have its cylinders set in line, both pistons attached to one rod and with simultaneous movement, the exhaust from the front or upper end of the small cylinder going directly to the back or lower end of the large, and that of the back or lower end of the small cylinder going to the front or upper end of the large; in which case but one crank will be needed, but the pressure on the crank-pin will be very varying and the motion very unsteady. (See Sectional Plan of Cylinders and Valve Gear.) They may be side by side, having two piston-rods united to a common crosshead, and requiring but one crank; the exhausts being in the same direction and order as in the first case named. This has nearly all the disadvantages of the first way, plus the additional objection of taking up more room. The cylinders may stand side by side, but with the exhaust from each end of the small cylinder going directly to the adjacent end of the large cylinder. In this case the pistons will travel not together, but in opposite directions; and two cranks will be needed. This will have the advantage of great steadiness of motion and less shock and strain on the parts. Instead of going directly from the small cylinder to the large one, the steam may be taken into a 'receiver' or intermediate reservoir, which will enable the small cylinder to get its steam at a more advantageous time than when there is no receiver; permitting more advantageous points of cut-off, exhaust, etc.; and allowing both the work and the strains to be more evenly divided



Sectional Plan of Cylinders and Valve Gear, Tandem Compound Engine.

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between the cylinders or among the various divisions of the crank rotation.

It must be understood that either a single-cylinder expansive engine, a compound, a triple-expansion, or a quadruple-expansion engine may be either single-acting or double-acting, condensing or non-condensing; though it is rare that a compound engine of any size is used non-condensing.

By reason of the varying amount of the piston pressure, and of the varying angle at which that pressure acts on the crank, particularly with early expansion, the motion of any single-cylinder reciprocating engine would be exceedingly unsteady; and there would be also liability of the engine being stopped when the piston-rod, the connecting-rod, and the crank were in the same line, which occurs at each end of each stroke—the corresponding crank positions being called the dead points. Having two or more cylinders each with its own crank, these cranks arranged at proper angles about the shaft, increases the steadiness of motion, and naturally precludes the risk of the engine stopping on the dead-centres; but there remains another source of irregularity of motion, due to the varying nature of most loads, and to the varying steam-pressure with which the cylinder is supplied by the boiler. Increase of load without increase of pressure, or decrease of pressure without change of load, would tend to make the engine slow down; while decrease of load without change of pressure, or increase of pressure without change of load, would tend to make it speed up. Still greater variations in speed would be caused by simultaneous increase of pressure with decrease of load, or increase of load and decrease of pressure. To prevent this, two attachments are made: the first, a heavy-rimmed wheel fixed to the shaft; the second, an automatic device for either lowering the initial steam pressure or cutting off earlier, on any tendency to increase speed; and increasing the initial steam-pressure of cutting-off later on any tendency to slow down. The first device is called a fly-wheel; the second a governor. The fly-wheel acts solely by its inertia. While the engine is getting up to its speed, the fly-wheel is absorbing power. Any sudden and momentary tendency of the engine to increase its speed is counteracted in great measure by the fly-wheel, which, if heavy enough and of sufficient diameter, absorbs nearly all the excess, paying it out gradually until the normal speed is again reached; thus making, of what might otherwise be a running away or racing, only a slight gradual increase of speed, followed by a gradual decrease to the normal amount, if the conditions remain normal. In the same way any sudden and momentary tendency of the engine to slow down would be met by the fly-wheel by a giving out of momentum; so that what might be a very considerable momentary slowing down, is changed to a very slight and gradual decrease of speed, followed (if the conditions are restored to their normal state) by gradual return to the normal speed. In other words, the fly-wheel acts as a storehouse of power: its inertia causes it to oppose any

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tendency either to slowing down or to speeding up. The greater the weight of fly-wheel rim for a given diameter and rotation-speed, the heavier the rim for a given diameter and rotation speed, and the faster the rotation-speed for a given rim-weight and diameter, the more efficient it is in keeping the rotation-speed uniform; so that where there are expected great variations of pressure or of load, or where great regularity is intended, it is necessary only to increase sufficiently either the rim-weight, the diameter, or the rotation-speed.

But it must be remembered that a fly-wheel can take care of only momentary variations in pressure or in load. It only distributes through many rotations an excess of power that would be inconvenient if used during a few; or stores up in attaining the regular rotation-speed, enough power to keep the engine going for a few turns at nearly the regular speed, in case of momentary increase of load or decrease of pressure; but it has no power to keep the engine steady during continued increase or decrease of pressure or of load. If the load were taken off and the pressure kept up, or the load kept the same and the pressure doubled, the engine would run away and probably wreck itself, despite the fly-wheel; and *vice versâ*, if the load were doubled and the pressure not increased, or if the load remained the same and the pressure fell to one-half, the engine would slow down, fly-wheel or no fly-wheel. To take care of permanent or of long continued variations in either load or pressure, there is used an automatic governor, usually depending for its action on so-called centrifugal force. In the centrifugal governor, which exists in several modifications of two general types, a weight attached to an arm maintains a certain position with respect to its centre of rotation, as long as the speed remains at the normal rate; but tendency to increase of speed causes the weight to recede from the centre, and in so doing its arm is caused to alter either the amount of opening for steam, or the point at which it is cut off. If this centrifugal regulator or governor acts to lower the initial pressure by reason of an attempt at increase of speed, it is called a throttling-governor; if, as is the case on higher grade engines, it causes cut-off to take place earlier, it is called a cut-off governor. In either case the result is the same; the mean effective pressure on the piston is reduced. The tendency of the engine to go fast causes the governor to exert a retarding influence; and *vice versâ*. Usually the centrifugal governor over-regulates at first, so that a tendency of the engine to run, say five per cent. too fast, is met by the governor causing it to run say four per cent. too slow, then three per cent. too fast, next two per cent. too slow, then one per cent. too fast, and so on. The fly-wheel acts in harmony with it to prevent these dancing tendencies from being manifested except to the most delicate apparatus.

The points of cut-off may be fixed or variable. If fixed, the regulation can be only by varying the initial pressure. If variable, a change may be effected (1) by hand, (2) by

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the governor. In both cases, the changes may be made while the engine is running. If the point of cut-off is variable, it may be either (1) by hand, or (2) automatic; in the first case, this may be (1) while the engine is at rest, or (2) while it is running. If the governor varies the point of cut-off while the engine is running, it may do it either (1) by never releasing control of the cut-off-varying valve, and doing the actual work of moving that valve, or (2) by indicating the point at which the cut-off valve shall be closed by a weight or a spring; the governor in this case practically only pulling the trigger of the cut-off mechanism. In the first case the cut-off is said to be positive; in the second, 'drop' or 'detent.'

Valves.—The valves which effect the steam distribution, that is which let it in, cut it off and let it out, may be of three general types: slide, plug, or poppet. Slide-valves are properly those which have a lengthwise motion or its equivalent; controlling admission and eduction ports at right angles to the cylinder bore. They are of three classes: flat, rocking, and piston.

The most usual type of flat slide-valve is of D section, consisting practically of a block having a flat working side, in which there is a central cavity, and which slides over three parallel ports at right angles to its line of motion. Each of the outside or end ones of these three ports serves alternately as an induction and an eduction port; one serving each end of the cylinder. The central port serves only as an exhaust-passage, and acts in this capacity for each end of the cylinder in turn. The central cavity in the slide-valve places the central valve-seat port in connection with each of the end ports alternately; and the outside lips, legs, or blades of the block alternately open and close the end-ports for admission of steam from the chest or box in which the valve slides.

Substituting for the sliding block a portion of a cylinder, turning in a hollow seat ported in the same way as for a plain slide, giving this partial cylinder a similar cavity to that in the slide, partial rotation of this 'rock-valve' about an axis at right angles to that of the engine cylinder will cause each end-port to be placed in steam connection with each end of the engine cylinder in turn; and will cause each also to serve in turn as an eduction port for one end while the other end-port is serving as an admission-port for the other end. The cavity or arch in the valve will place each end-port in turn in connection with the central or exhaust-port.

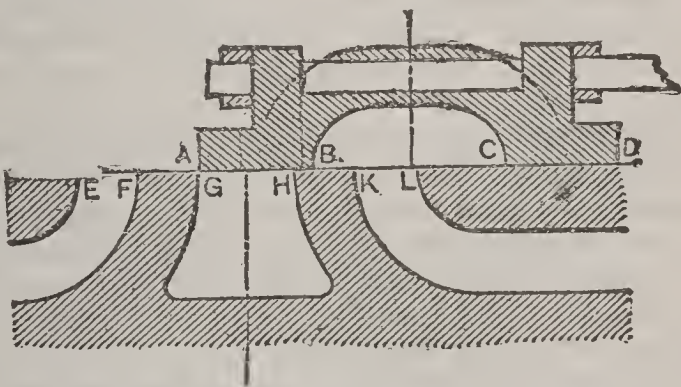
Instead of developing the slide-valve into a portion of a cylinder having its axis at right angles to that of the engine cylinder, we may wrap it around an axis parallel to that engine cylinder axis, and let it play in a shell similarly ported to the plain valve-seat, and we will have what is known as a piston-valve, having both inside and outside lap. With this valve it is necessary either to place the two ends of the steam-chest in connection with each other, or both with the steam-supply pipe, or to connect the two ends by a tube permitting steam to pass through the valve

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from one end of the chest to the other, without passing into the valve-arch or cavity.

If the legs or lips of a slide-valve exactly coincide with the end-ports, with a trifle extra width to insure tightness, and the valve is at its mid-position when the piston is at stroke-end, a complete forward and backward half-stroke of the valve will coincide with a single piston stroke in one direction only; steam admission for one end of the cylinder and exhaust for the other taking place when the piston is at stroke-commencement, and continuing until stroke-end. If, however, the valve face is extended at each outside end beyond the outside edge of the end-ports (as shown in Section of Lapped Slide-valve), the valve will have to start with one of its outside edges in line with the outside edge of the end-port, at the time that the piston is at stroke-commencement; and in this case admission will be continued during only a part of the stroke, and cut-off will occur at such time as the returning valve covers the admission-port; the length of time during which full steam will be admitted depending on the length of valve-travel. The shorter the valve-travel, for a given 'lap' or excess of valve-length over the distance between outside edges of the end-ports, the shorter the period of admission.

A valve having such excess of length of leg or blade over the distance between outside port-edges is called a lapped valve, the excess being called steam lap, or simply 'lap.' The addition of steam lap will affect the exhaust, not because the steam edge of the valve, thus lengthened, is ever touched by the exhaust, but because of the change in the relative times of the valve and the piston being in their mid-positions. This change of time caused by lengthening the valve will cause it to open for exhaust before the advanced stroke is ended; and to close the exhaust before the return stroke is completed. The first event is called pre-release; the second cushion or compression, because it causes the exhaust steam to be compressed in the cylinder-



Section of Lapped Slide-valve, causing steam admission at the left-hand end, and compression at the right.

end between the piston and the valve-face. The shorter the valve-travel for a given addition or lap, the greater influence the lap will have in causing cushion to come earlier and pre-release later. If the valve has the inside edges of the legs or blades prolonged between the inside edges of the end-ports, so as to make its arch or cavity shorter than

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the distance between such inside edges (as in the annexed cut), the effect of this 'inside lap' or 'exhaust lap' will be to cause it to open for pre-release later in the advancing stroke, and to close the exhaust for cushion or compression earlier on the return stroke. The greater the lap (either exhaust or outside) for a given travel, the greater its effect; but the greater the travel for a given inside or outside lap, the less the effect.

In some valves, instead of the valve-arch being made shorter than the distance between inside edges of the end-ports, it is longer. The effect of this 'negative inside lap,' or 'negative clearance,' is to cause pre-release to take place earlier, and compression later, than if there was inside lap, or than if the valve-arch edges were 'line and line' with the inside edges of the end-ports.

In order to give the steam a better chance to fill the cylinder quickly, particularly at high piston-speeds, it is usual to set the valve and its driving mechanism so that it opens the end-ports for admission a minute portion of time before the piston has arrived at stroke-end and is ready to reverse. This advancement is called 'lead:' its effect, with an ordinary slide-valve, is to cause not only pre-admission but hastening of cut-off, release, and compression.

If the passages between the valve-seat of the ordinary slide-valve or rock-valve and the cylinder-bore are short, it necessitates a long valve, which will have more unbalanced pressure than if it is short. If, in order to give a short valve, the passages are long, then there is at stroke-end excessive waste space between the piston-rod and the valve-face, and this affects the expansion; and unless there is considerable exhaust-compression, will cause a waste of steam, necessitating that each time the cylinder is filled, that waste clearance-space shall be filled also; while the steam used to fill it does no useful work in driving the piston up to the point of cut-off. As the piston slide-valve has on it no unbalanced pressure, its friction is comparatively slight, and it permits the passages being short and the valve long, thus avoiding much of the loss from waste clearance.

In order to prevent excessive friction and consequent loss of power and excessive wear of the flat slide-valve and seat, it has been proposed to cause the valve to run on rollers; but the plan has not proved mechanically practicable. Another way of reducing the friction is to lessen the unbalanced pressure which causes it; and this is done by providing the valve at its back with a plate or ring bearing against a plate opposite the seat: such a device is called a balanced valve. The principal objection to this plan is that it is difficult to keep it tight without excessive friction and wear, and that if for the purpose of changing the point of cut-off the valve is required to have variable length of travel, it may run for a long while with short travel, and wear at the end of every stroke a shoulder, against which it will jam if the travel is increased.

The advantage of the slide-valve is that with one valve

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the functions of admission, cut-off, release, and compression may be performed for both ends of the cylinder. Its principal disadvantage is that it ordinarily entails excessive waste-clearance in the passages, and that a change in the time of any one of these functions necessitates a change in all the other three; also that a change in any one of these at one end of the cylinder causes a change not only in the other three at that end, but in all four at the other end. To give greater flexibility in this respect, there are three ways of doing. The ordinary slide-valve may be retained, to control the steam distribution at both ends of the cylinder; but it may be supplemented by a separate cut-off valve which controls the cut-off at both ends, and which may by very little increase of complication be made to permit variation of cut-off in one end independently of the other. Another way is to give each end of the cylinder one valve which will effect admission, cut-off, release, and compression for that end. Another is to have one valve which shall control the admission and cut-off for both ends, and another valve which will control the release and compression for both ends. A further development is not only to have one opening for admission and one for eduction at each end, but to have each controlled by a separate valve; and in some cases there are not only two eduction and two admission valves, but on each admission-valve a separate cut-off valve, making six valves and four cylinder-openings.

When more than one valve is provided to effect the steam distribution, it is usual to leave the three slide-valve types, and to use either a plug-valve, which is approximately cylindrical, and lies across the cylinder axis; or a poppet, a disk supported upon a vertical stem, and closing on a circular seat. Nearly all the high-grade engines of the present day use valves of one of these two latter types.

The objection to the cylindrical plug-valve is that the wear of the valve and of its seat are in different directions; the valve wearing to a smaller radius, the seat to a larger, so that in time there is leakage between them. This may be avoided by giving them a slight taper, and taking up the wear by endwise adjustment. This, however, does not avoid the friction of the contacting surfaces; but this may be lessened by hanging the valve upon hardened trunnions which keep it practically suspended above the seat, at a distance which while infinitesimal and preventing passage of steam, yet prevents rubbing and wear.

The poppet-valve may be either single beat or double beat, according as it has one or two disks and takes steam on only one side or both above and below. In the latter case there is less unbalanced pressure and its action is more quiet.

Valve-gear.—Equally important with the valves which effect steam distribution are the mechanisms for producing the proper motions of those valves. These valve-gears, or valve-motions, as they are also called by engineers, vary according to the results which they are intended to produce, also with the circumstances under which they are to be worked. As regards the results which they are to produce, the first consideration is whether they are

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to cause all the functions of steam distribution with one valve or with two or more; and if with two or more, whether the same steam ports are to be used alternately for admission or exhaust, or there are separate admission and eduction passages and ports.

The original D slide-valve, causing the four functions of steam distribution with but one valve and using the same cylinder-ports alternately for admission and eduction, is the most common and the most simple; and permits of the most simple gears or mechanical movements to drive it. The simplest method for effecting its reciprocation is by a crank on the main shaft; a connecting-rod of this crank operating directly on the end of the valve-rod if the valve is on the side of the cylinder and in the same plane with the cylinder axis and the main shaft. In those cases where the valve is on top of the cylinder, or below it, it is necessary to have a rocker arm to convey the to and fro motion out of the common plane of the cylinder axis and main shaft. As by reason of the angularity of the connecting-rod such an arrangement effects irregular steam distribution, particularly if the connecting-rod is short, what is known as the Scotch yoke has been used at times for those cases where the valve is on the side. This consists of a T head upon the valve-rod, having a slot in which the valve crank-pin plays; rotation of the latter causing to and fro motion of the valve-rod.

Instead of the crank there is generally employed an eccentric, which practically differs from the crank only in appearance, being in effect a crank-pin enlarged into a disk which includes the shaft that drives it. The strap surrounding this disk connects, by an eccentric rod which is readily attached to it, with the end of the valve-rod; and this rotation of the eccentric disk (or sheave as it is often called) causes the desired reciprocating motion of the valve-stem. The eccentric, like the crank, may work the valve stem either directly or through the intervention of a rocker.

With any of these arrangements, it is impossible to vary the point of cut-off of the valve, as could be done if there were some provision for altering its length of travel. It is equally impossible to reverse the engine. But variation of cut-off, and reversal of the engine, are absolutely necessary for marine and locomotive engines, and very desirable in the case of most stationary engines. The arrangement for varying the distance of the eccentric from the shaft centre enables variations of its amount of throw, and thus permits variable cut-off. Such sliding eccentrics are in common use. A similar arrangement for changing the position of the eccentric on the shaft, by angular rotation, enables reversal of the engine, either with or without variation in the point of cut-off. Where it is desired to move a main valve and an independent cut-off valve working on its back or on a seat back of the main valve, it is necessary to have two eccentrics which are usually put side by side on the shaft, one causing invariable amount of travel of the main valve and the other providing for a variable travel

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of the cut-off valve, the lap of which is changed by suitable means at the steam-chest.

The shifting eccentric has many advantages, and the means commonly adopted to effect a variable cut-off, and permit reversal of the engine, is by what is known rather improperly as the 'link-motion.' The most common of these, and which may be found under almost any locomotive in the United States, is known as the Stephenson or shifting link-motion. It has two eccentrics for each cylinder, placed side by side on a shaft (which in the case of the locomotive is a driving-axle) and connected by their rods with the ends of a curved 'link' having in it a slot the radius of which is equal to the length of the eccentric-rods. In this slot there plays a block which is attached to one end of a radius-link with its other end fastened to the end of the valve-stem. The link itself is suspended by a hanger which is connected with a lever by which the link may be raised and lowered, thus driving the block (and through it the valve-stem) with various parts of the slot and with various amount of travel, according to the height to which the link has been raised. If with the link lowered so as to bring the block in the extreme upper portion of the slot, the valve is given a maximum amount of travel in such relative direction of motion as to cause the engine to move ahead, gradually raising the link will give the valve gradually decreasing travel, and thus effect gradually earlier cut-off, until that point is reached when the valve has no motion at all, when cut-off will be at the beginning of the stroke, that is, there will be no steam admission, and the engine will not run at all. Further raising the link will give the valve gradually increasing travel in the other direction, and cause gradually later and later cut-off, the engine running backward. If the rods leading from the eccentric to the link be not crossed, the lead of the valve will increase as the cut-off is made later and later, and *vice versa*; but if the rods be crossed, the lead will decrease as the cut-off is made later. This variation of the lead is in some cases a decided disadvantage, in others an advantage.

In what is known as the Gooch motion, the link-slot has its convexity toward the shaft or axle, and instead of the slotted link being raised and lowered to vary the cut-off or the direction of motion of the engine, it can not be raised and lowered, but at its dead point is fastened to a radius-link which swings about a fixed point. The block is raised and lowered by suitable lever connections. In this link motion the lead is constant no matter what the point of cut-off or the direction of motion. In the Allan (by some called the Trick) link-motion, the link and its slot are straight, and the connections are such that the link is raised as the block is lowered, and *vice versa*. In the Pius Fink link-motion, the most simple of all, there is a single eccentric, to the strap of which there is rigidly attached a link, the slot in which has its convexity toward the main shaft. Between the slot and the centre of the main shaft the link and strap are pivoted, and are attached to the swinging end

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of a radius-bar, whose other end is pivoted to a fixed point. There slides in the link slot a block which drives the valve-stem through a connecting rod, and whose position in the slot may be varied at will, thus changing the amount of expansion or the direction of motion while the engine is running.

Another method of driving the valve, which has been very largely introduced in marine engines, and in England on locomotives, is what is miscalled the radial gear. There is usually a radius-rod either from the crosshead, whose motion is strictly rectilinear, or from some point of the connecting-rod, which of course gives an elliptical motion. This straight or elliptical motion is modified by suitable swinging links, so as to effect varying amount of valve-stem motion, also so as to cause the engine to run in either direction required.

For such cases as those where there are two or more valves for admission and two for eduction, it is usual to drive all from a 'wrist-plate' or its equivalent, which is driven by a single eccentric, or from which the valves are driven by connecting-rods or other attachments. In this we have what is known as 'drop cut-off' or 'detent motion'—the connection with the exhaust-valves being constant, while that with the admission or cut-off valves is maintained only so long as the governor permits certain 'catches' to remain in action. So long as the catches are effective, steam is admitted; when by the action of the governor, they are withdrawn from action, the valves are instantly closed by a spring, weight, or dashpot. This is the method adopted in the celebrated Corliss engines, and in most of their imitations, variations, and improvements.

See THERMODYNAMICS: also BOILER: VALVE: SCREW PROPELLER. Also, for History, see Galloway, *The Steam Engine and Its Inventors* (1881).

STEAM-HAMMER.

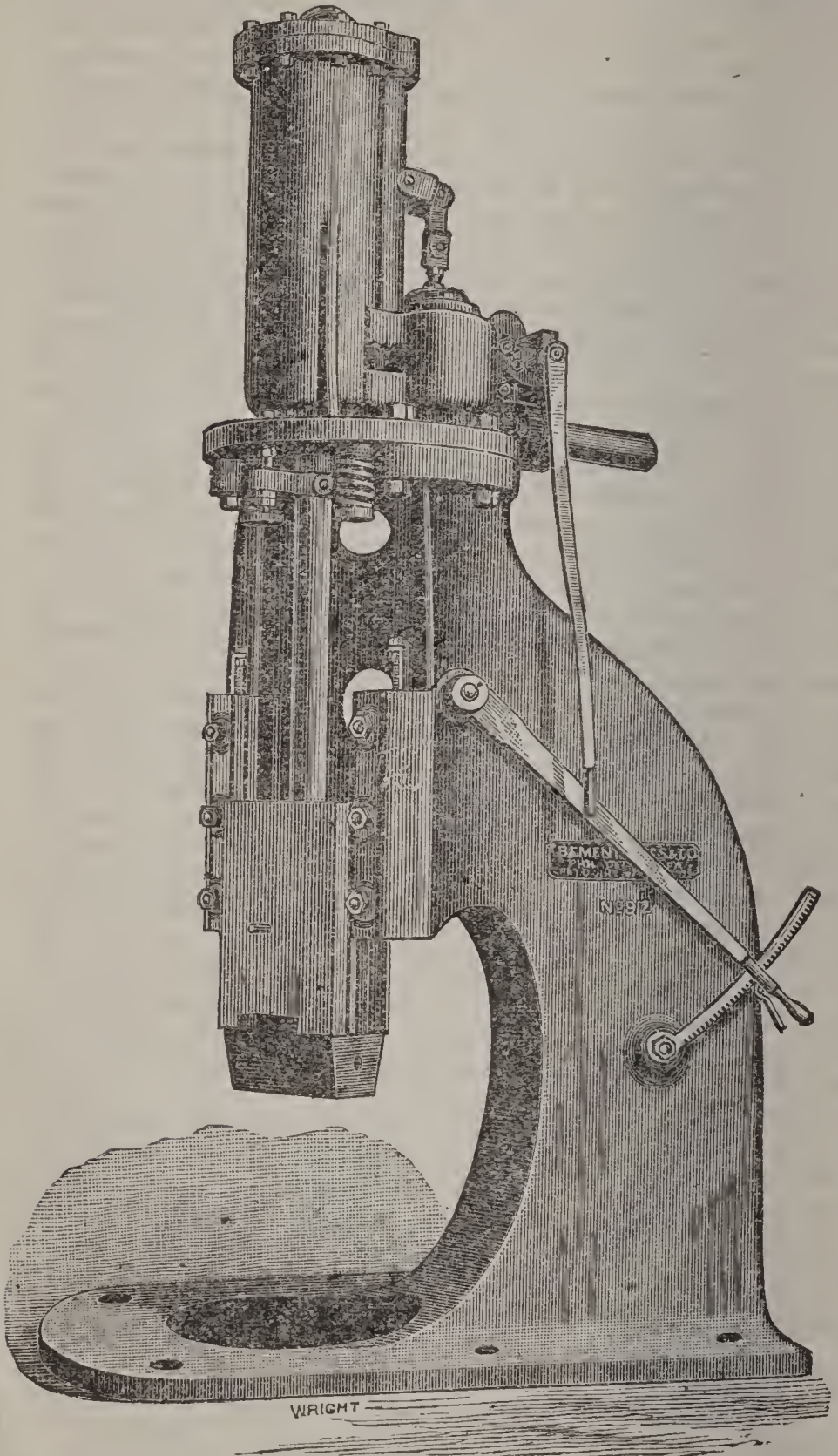
STEAM HAMMER: a most potent factor in developing one of the greatest of industries, that of iron-working; giving force, speed, and adjustability to the blows in forging; also making possible new industries, such as drop forging on a large scale. Without it, the iron steamship would have been practically an impossibility, and the locomotive would have been greatly retarded in its development.

In 1784 James Watt patented a S.-H., which seems the first on record; but he never constructed one. In 1806 Wm. Deverell patented one which like that of Watt was direct acting; but this was never built. It was not until 1839 when James Nasmyth (q. v.) sketched a plan of a S.-H. for forging the paddle shafts of the steamship *Great Britain*, that the idea again came up; but the Nasmyth hammer was not built either by or for him. Three years afterward he was surprised to find at Creuzot, France, one made from a copy of his own sketch; after which he patented it in England, and in 1843 made one. In this the ram was raised by the action of steam under a piston in a vertical cylinder to which steam was admitted by an ordinary slide valve worked by hand. This machine was defective not only by reason of the great amount of power required to move the valve, but from the fact that it was difficult to bring the ram up at once after the force of the blow had been expended. While this was necessary both by reason of increased speed of working, and because at first there was some tendency for the ram to chill the metal that was being worked, the fact that the point of impact and that at which the force of the blow was expended had no definite relation with each other and varied at each stroke, made it difficult to effect true automatic action. Nasmyth was on the point of abandoning the hammer, when Robert Wilson produced a valve motion which enabled the blows to be regulated in speed and in force, and the hammer was made absolutely automatic if desired. It was so completely under control that a common pastime was to place an egg in a wineglass upon the anvil, and after patting it delicately with the ponderous ram, suddenly smash it with a thundering blow. The substitution of Wilson's circular balanced valve for the plain slide-valve gave increased ease and precision. Later, Wilson produced the double-acting hand gear motion by which the ram was not only raised by steam, but aided thereby in its descent, thus greatly increasing not only the speed of working, but the range of force of blow.* The original S.-H. had comparatively a small piston rod, with a heavy tup or ram; at present the rod itself is ponderous, and forms a considerable portion of the weight.

As at present constructed, steam-hammers not only permit the blow to be either by dead weight or occasioned by steam at will, but the operator may vary at will the length and force of the blow as well as the manner of its reception; and every hammer (except the largest, which are never automatic unless especially ordered) is either automatic or workable by hand at the will of the attendant.

STEAM-HAMMER.

In addition to delivering dead and cushioned blows, the best hammers are so arranged that with them a slow steady pressure like that of a hydraulic press may be given, for



Bement Steam-hammer.

the purpose of cutting off stock, and other manipulations. The standards may be either single (in which case there is but one upright which is curved laterally) or double, which

is by far the strongest construction; and in very large machines, each leg of each vertical standard may be spread or divided to increase the accessibility of the machine and the facility by which various kinds of work may be handled on it. In large hammers the anvil has a foundation and framing supported independently from the hammer supports; and is furnished with an adjustable cap. The valve is properly constructed so that it will take up its own lost motion when it has worn; the guides are adjustable for wear, and there are taper shoes for facility of adjustment of dies. For irregular shapes, such as cranks, marine rudders, etc., and particularly for working pedestal jaws for locomotive frames, there should be an extra long stroke, say 45 inches; and for this work a ram weighing 1,600 lbs. is best; but a more usual weight of ram is 700 lbs. for heavy iron work, with a stroke of 21 inches; and for drawing down steel, where speed of working is essential, a still shorter stroke is used. For drop or stamp work the die should rest at the top of the stroke.

The S. H. has the advantage, in working large masses of metals, that its blows penetrate more nearly to the centre of the mass than those of lighter hammers, and thus render it unnecessary to overheat the outer layers in order to give the inner ones moderate heat. In drop forging it is often found convenient to make several pieces at once, connected by fins, which may very readily be cut up by the hammer itself or by a special tool. This method greatly reduces the cost of manufacture where the quantity of the articles is great, and at the same time makes the density and quality of the articles more uniform.

In Condie's modification the cylinder itself formed the ram; but this system has gone out of use. There have been made duplex hammers in which there is no anvil, but the object to be forged is struck by rams from two opposing sides: these have not come into common use. See HAMMER, STEAM OR POWER: FORGING: WELDING.

STEAM-HEATING: see WARMING AND VENTILATION.

STEAM-NAVIGATION.

STEAM-NAVIGATION: modern development of the use of steam in the propulsion of vessels. The first recorded attempt at S.-N. was that of Blasco de Garay in the harbor of Barcelona 1543. The fact is surprising that 30 years should have elapsed—between 1777, when the steam-engine had become in Watt's hands an efficient power, and 1807, the date of Fulton's first voyage—before a really serviceable steam-vessel was produced. The connecting link seems to be the use of revolving-paddles instead of oars. Wheel-boats propelled by oxen, horses, or men were known to the Romans, and were used for ferry-boats in modern times.

As early as 1736, Jonathan Hulls had taken out a patent in England for a tow-boat to be propelled by a paddle-wheel set in motion by a sort of steam-engine: the project appears never to have been executed. Besides some experiments on the Seine by Comte d'Auxiron 1774, and Perier 1775, the Marquis de Jouffroy constructed a steam-boat of considerable size 1782, which navigated the Saône for some time; but it was deficient in power. In the United States experiments began to be made about 1783, by John Fitch (q.v.) and Rumsey. Fitch launched a paddle steamboat 1787, which moved at the rate of three miles an hour; but before proceeding far the boiler burst: Fitch's fourth steamboat (1790) made 8 m. an hour on the Delaware. Rumsey proposed to propel the vessel by making a stream of water issue with force from the stern; his attempt failed.

The next important experiment was by Miller, of Edinburgh, and Taylor, tutor in his family, 1788, Oct. 14, on a small lake in Dumfriesshire. A small engine having four-inch cylinders of brass was prepared, under Taylor's superintendence, with help of Symington an ingenious mechanic, and was fitted on board a double-boat, with a paddle-wheel in the interspace. Next year a vessel in which Miller had had larger engines fitted was tried on the Forth and Clyde canal, and moved at the rate of seven miles an hour. In 1801, Symington took out a patent for construction of steamboats; and 1803 built the *Charlotte Dundas* to tow vessels on the Forth and Clyde canal. The success seems to have been complete, except that the agitation of the water by the paddles washed down the banks in an alarming manner. The use of the vessel was therefore given up, and it lay at *Lock Sixteen* for many years.

In the meantime, attempts had been made at S.-N. in the United States by Stevens, Livingston, and others. John Fitch's paddle steamboat (first 1785) has been referred to above. Robert Fulton (q.v.) had given attention to steam as a motive-power for vessels as early as 1793: travelling into Scotland, he visited the unfortunate *Charlotte Dundas*, and obtained drawings of the machinery. Returning to America with one of Boulton and Watt's engines of 20 horse-power, he, in conjunction with Livingston, built a vessel called the *Clermont*, at New York, and in 1807 made the first really successful long voyage by steam,

from New York to Albany up the Hudson. The vessel sailed 110 m. in 24 hours, against stream and wind. Fulton has thus the honor of having first proved the practical utility of steam-navigation for long distances; though the steam-packet built by John Fitch had made short trips on the Delaware (1790). Nothing but money seems to have been lacking to Fitch for equal success; and nothing but perseverance to Miller, Taylor, and Symington. Four years later, 1811, Henry Bell of Glasgow, who had witnessed the experiments on the canal 1789, and had accompanied Fulton on his visit to the *Charlotte Dundas*, started a steam-boat, the *Comet*, on the Clyde, and was thus the father of steam-navigation in Britain.

In 1815, a steamboat made a passage from Glasgow to London; and 1818, one plied from New York to New Orleans; 1820 steam-packets were established between Holyhead and Dublin. 1838 was a memorable year in the history of steam-navigation. The steamer *Sirius* sailed from Cork, Ireland, Apr. 4; the *Great Western* from Bristol, England, Apr. 8: both arrived at New York on the 23d, the *Sirius* only 12 or 15 hours before the other. The passage is now often made from Queenstown to New York in six days. The opening of the Suez canal greatly promoted swift steam-communication with India, China and the East, and Australia. Since 1880 some of the Orient line of steamers make the passage from Plymouth to Australia in 30 to 35 steaming days. Steam-vessels are now found on all seas and on lakes and streams. War-steamers have taken the place of the old ships of the line: and steam has largely superseded sails. The maximum speed yet attained by steam-vessels is about 25 m. an hour; the ordinary rate 8-15 miles.

The steam-engine employed to propel a vessel does not differ essentially from any other; but only by some special modifications. In ships of war the cylinders are generally placed horizontally, and the whole machinery kept below the water-line; in merchant-vessels vertical engines are more common, with the cylinders inverted, placed right above the propeller-shaft. The tendency is to replace the paddle-wheel by the screw. On the latest ocean ships twin-screws have been introduced, set sometimes one in advance of the other and sometimes revolving at slightly different speeds, or else set symmetrically. In such cases the best practice is to have a complete longitudinal bulkhead, dividing the engine and boiler rooms, with their contents, into two complete isolated parts, working independently. On some war-vessels three screws have been proposed. Bow and stern screws are now sometimes used, especially on ice-boats and double-ended ferry-boats: they are becoming the favorite type in the waters of New York city. A single line of shafting runs from bow to stern of the boat, and carries screws of identical pitch and diameter, one at each end of the boat: these are found to be exceedingly efficient in ice, and in making their way into their slips.

The modern first-class ocean ship is about 600 ft. long,

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50 to 60 ft. wide, and 40 ft. deep: it will rate at about 10,000 tons. There are a large number (15 or 20) of water-tight compartments, and a double bottom often adds to the ship's safety. The engine is generally of double or triple expanding type, and can develop 10 to 20 thousand horse-power. The steam-pressure is constantly increased, recent ships carrying 150 lbs. to 180 lbs. pressure per sq. inch. The coal consumption may be more than 300 tons per day. The engines consume little water—the condensing arrangements being so perfect. As a type the *Teutonic* of the White Star Line, plying between New York and Liverpool, may be cited: the length is 582 ft.; width 57 ft. 5 inches; depth 39 ft. 4 inches; tonnage 9,685; horse-power 17,000; steam-pressure 180 lbs. per sq. inch: there are 11 transverse bulkheads, with self closing doors: the cylinders are 43 inches, 68 inches, and 110 inches diameter: the stroke is 5 ft. Forced draught is used in the furnaces. The propellers are 21 ft. 6 inches diameter, and 28 ft. 5 inches pitch.

Modern ocean vessels are generally of steel and iron; wood still is used in this country for many river boats, though metal hulls are being more used each year. The American type of river steamer has very wide guards, nearly doubling the width of deck. In wooden river steamers the hull is often strengthened by trusses, called 'hog-frames.' In iron vessels this is not needed.

Many paddle-wheel steamers are still in use on the inland waters of this country. On these boats the innovations are in the direction of compounding the engines, using direct-acting instead of walking-beam engines, and in the successful introduction of feathering paddles. A minor invention is the auxiliary steering-screw for propellers, invented by a Hungarian engineer, J. J. Kunstädtér. This is a smaller screw carried directly aft of the main screw, but having a short independent shaft of its own journaled in the rudder, and connected to the main shaft by a universal joint. This screw rotates therefore with the main screw, but is carried to one side or the other with the rudder so that it aids materially in turning the vessel.—See STEAM-ENGINE: PADDLE-WHEEL: SCREW-PROPELLER.

STEAN, or STEEN, n. *stēn* [AS. *stæna*, a drinking-vessel]: in *OE.*, an earthen drinking-pot; a jar.

STEARIN, n. *stē'ă-rĭn* [Gr. *stēar*, suet, *stēātos*, of suet F. *stéarine*]: the tristearate of glycerin, a constituent of fat. STEARIC, a. *stē-ăr'ĭk*, pert. to stearin, or obtained from it, as *stearic acid*. STEARATE, n. *stē-ă-rāt*, a salt of stearic acid. STE'ATITE, n. *-tīt*, soft magnesian or talcose mineral; soapstone (see below). STE'ATITIC, a. *-tīt'ĭk*, pert. to soapstone. STEATOCELE, n. *stē-ăt'ō-sēl* [Gr. *kēlē*, a tumor]: a tumor seated in the scrotum, consisting of a suety substance.—*Stearic Acid* is represented by the formula $C_{18}H_{36}O_2$; being one of the solid fatty acids represented by the general formula $C_nH_{2n}O_2$. It exists as a glyceride (stearin) in most fats, and is especially abundant in the more solid kinds, such as mutton-suet. It is readily ob-

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tained by saponifying suet, or, better, cacao fat, with soda lye, heating the soap-paste with water and dilute sulphuric acid, removing the separated fatty acids after cooling, washing them with water, and then dissolving them in as small a quantity as possible of hot alcohol. The oily acids thus liberated are compressed between hot plates, by which means most of the Oleic Acid (q.v.) which is present is expelled. The solid residue is then to be repeatedly crystallized from alcohol, and afterward from ether till the fusing-point becomes constant at 159° F. If the final solution is allowed to cool slowly, the acid is deposited in beautiful, colorless transparent rhombic plates. After fusion, it cools into a wax-like, glistening, crystalline mass, devoid of taste or smell. It is insoluble in water, on which it floats, but dissolves in alcohol and ether, its solution reddening litmus powerfully. When heated, it distills for the most part without alteration. Chlorine converts it into chlorostearic acid, $C_{18}H_{35}ClO_2$. Heated with bromine and water in a sealed tube, it is converted into bromostearic acid, $C_{18}H_{35}BrO_2$, and dibromostearic acid, $C_{18}H_{34}Br_2O_2$. Stearic acid forms both normal and acid salts. Commercial stearic acid or impure stearin is prepared on the large scale by saponifying the harder fats, generally with lime. The resulting lime soap, decomposed by sulphuric acid, yields a mixture of fatty acids, which are pressed first in the cold, and then at a higher temperature; to separate the oleic acid from the less fusible palmitic and stearic acids. Another method consists in treating the fat with sulphuric acid, and distilling the product. The only normal stearates soluble in water are the stearates of the alkalies, whose solutions are frothy and form a lather, but on addition of excess of water, separate into an acid salt which is deposited in silky crystalline plates, and the free alkali which remains in solution. The stearates of the alkalies also are soluble in alcohol. Chloride of sodium (common salt) has the property of separating the alkaline stearates from their solution. The stearates of the alkalies are the principal constituents of the various kinds of soap. The other stearates are insoluble. Stearate of lead, one of the constituents of lead-plaster, is readily formed by mixing solutions of sodium stearate and acetate of lead, when the stearate of lead falls as a heavy amorphous precipitate, sparingly soluble in alcohol or ether, but dissolving freely in oil of turpentine.

The *Bassic Acid* extracted from the oil of the seeds of *Bassia parkii*, tree growing in w. Africa, and the *Sterrophanic Acid* obtained from the berries of *Cocculus indicus*, are identical with stearic acid.

For the use of stearic acid in manufacture of candles, see CANDLE; also OILS.

STEAROPTENE, n. *stě'ă-rŏp'tēn* [Gr. *stēar*, suet; *ptēnos*, winged]: a solid crystalline matter deposited from many essential oils, allied to camphor. see OILS.

STEATITE—STEDINGERS.

STEATITE, *stē'a-tīt*, or **SOAP'STONE**: mineral composed principally of silica and magnesia, with more or less alumina and water. It is found massive, or sometimes assuming the forms of the crystals of other minerals which it has replaced. It is plentiful in many parts of the world, and is found in various localities in Vt. (Grafton, Athens, Westfield, etc.); in N. H. (Francestown, Pelham, Keene); in Mass. (Middlefield, Chester, etc.); in Md., Va., N. C., Ariz., S. D., etc. S. is generally white, reddish white, or yellow. It is soft and greasy to the touch, easily cut, but broken with difficulty. It is used in manufacture of porcelain. It writes readily on glass, and is used by glaziers for marking plates of glass before they are cut with the diamond. Tailors use it for marking cloth before they cut it. It is used also by shoemakers, to give unctuousity to the heels of stockings, that new boots may more easily be tried on. It is sold for such purposes under the names of Briançon Chalk, French Chalk, and Venice Talc. Slate-pencils made of S. are much used in the United States. S. readily absorbs oil or grease, and is used in powder for extracting spots of them from silken and woolen stuffs. It is the basis of Rouge (q.v.). It is used for imitating engraved stones, being easily cut, and afterward hardened by heat; after which, it may be colored by metallic solutions. It is largely used instead of firebrick in the construction of smelting furnaces, and for lining ranges, heaters, etc., also for making griddles (see **POTSTONE**). The American aboriginals made culinary utensils, tobacco pipes, symbolic figures, etc., of S. The S. product of the 6 states, Md., N. H., N. J., Penn., Vt., Va. (1880) was tons 12,715; value, at the quarries, \$51,575. For the fibrous form of steatite and its uses, see **TALC**. The *Agalmatolite* or *Figure-stone* of China is a kind of S., containing a little potash. Exquisite specimens of Chinese workmanship in this material are familiar. The earth eaten by the savages of the banks of the Orinoco and of New Caledonia is a kind of soft steatite. S. is classed by mineralogists as a variety of **TALC** (q.v.).

STEATO-, prefix *stē-a-to*, or **STEAT-** [Gr. *stear*, *stēatos*, tallow, hard fat]: fatty; composed of or resembling fat.

STEATOMA, n. *stē'ă-tō'mă* [Gr. *steatōmă*, a kind of fatty tumor—from *stear*, fat]: a tumor containing a substance resembling fat. **STE'ATOM'ATOUS**, a. *-tūs*, of the nature of a steatoma or fatty tumor.

STEDFAST, *stēd'făst*: a spelling of **STEADFAST** (q.v.).

STEDINGERS, *stēd'ing-ērz*, **THE**: community of Friisian Hollanders, 12th and 13th c., who settled on the lower Weser river, and resisted undue priestly domination. They were opposed to large exactions; and a crisis came when a priest at communion put into the mouth of one of their noblewomen, instead of the holy wafer, a groschen that she had paid at confessional. Her husband, finding that the complaint that he made was scorned, killed the priest. Hartwig II., Abp. of Bremen, demanded that the husband be delivered up and a large indemnity paid. This

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was refused, and a long crusade followed, renewed at times, 1207-34, when 11,000 S. were defeated finally at the battle of Altenesch, and killed, burned at the stake, or scattered. They were falsely accused of offering their children to an idol of Ammon. In 1834 a monument was erected to these valiant victims.

STEDINGK, *stă'dēngk* or *stĕd'īngk*, CURT BOGISLAUS LOUIS CHRISTOPHER, Count von: soldier, who participated in the Amer. revolution: b. Pinnau, Pomerania, then Swed ish territory, 1746, Oct. 26. He graduated at the Univ. of Upsala; served in war against Prussia; was lieut.col. of a Swedish regt. aiding France; embarked for America in the fleet of Count D'Estaing 1778; led a brigade in the action at Grenada, W. Indies; distinguished himself by signal bravery, and was wounded in the siege of Savannah 1779; was engaged in the Russo-Swedish war 1787; was ambassador of Sweden at St. Petersburg 1790, and plenipotentiary in the peace conference at Paris 1814.

STEDMAN, *stĕd'man*, EDMUND CLARENCE, A.M., LITT.D.: poet and critic: b. Hartford, Conn., 1833, Oct. 8. He studied at Yale Coll.; but did not graduate in course: the college authorities, however, conferred on him 1871 the degree M.A. and later LITT.D. He edited a newspaper at Norwich, Conn. 1852-54, and one at Winsted, Conn., 1854-56. Then settling in New York, he contributed poems to magazines and to the *New York Tribune*; among his lyrics of this period being: *The Diamond Wedding*; *How Old John Brown Took Harper's Ferry*; and the *Ballad of Lager-bier*. He was with the Army of the Potomac as correspondent of the *New York World* 1861-63. Returning to New York 1864, he adopted the business of stock-broker. His leisure was still given to literature; and he has since published numerous poems, many of them 'occasional' pieces. He published (1876) *Victorian Poets*, containing critical analyses of the writings of English poets during the reign of Queen Victoria; followed by *Poets of America* (1885). With Ellen Mackay Hutchinson he edited *A Library of American Literature* (11 vols., 1890). His collected poems were published 1884. He has delivered courses of lectures at Johns Hopkins, Yale, and Columbia univs. on the *Nature and Elements of Poetry* (afterward published in book-form), and in 1897 appeared *A Victorian Anthology*.

STEED, n. *stĕd* [AS. *stĕda*, a horse or stallion: Gael. *steud*, a horse, also to run: a horse from the *stud*]: a horse of high mettle for state or war. STEED'LESS, a. -lē's, without a horse.

STEEDMAN, *stĕd'man*, CHARLES: naval officer: 1811, Sep. 24—1890, Nov. 13; b. Charleston, S. C. At the age of 17 he entered the navy; served in the war with Mexico; in the Paraguay expedition was in command of the *Dolphin*; was loyal to the Union during the civil war, assisted in organizing the Mississippi river naval forces, and in various operations along the s. Atlantic coast, and commanded the *Ticonderoga* in a voyage to Brazil in

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pursuit of a Confederate cruiser. He was in charge of the navy-yard at Boston 1869-72, and in command of the s. Pacific squadron 1872-3. He became capt. 1862, commodore 1866, rear-admiral 1871, and retired from the service 1873, Sep. 24. He died at Washington.

STEED'MAN, JAMES BARRETT: soldier: 1818, July 30—1883, Oct., 18; b. Northumberland co., Penn. He removed to O. 1837; became a canal contractor, member of the legislature 1843, went to Cal. for gold 1849, but soon returned to O.; served on the state board of public works, and was afterward govt. printer at Washington. In 1861 he entered the Union army as col. of an O. regt., rendered distinguished service at Chickamauga and other points; was promoted maj.gen. 1864; was provisional gov. of Ga., and collector of internal revenue at New Orleans; was elected to the O. state senate 1879, and 1883 was chief of police of Toledo, in which city he edited a weekly paper. He died at Toledo.

STEEK: see STREIK.

STEEL, n. *stél* [Icel. *stál*; Dan. *staal*; Ger. *stahl*, steel]: iron refined and combined with carbon, used in making edge tools, etc., and now largely used in place of iron (see below): weapons made of steel, as swords; an instrument used by butchers and others for sharpening their knives: V. to point or overlay with steel; to make very hard; to make insensible or obdurate, as the heart. STEEL'ING, imp.: N. among *cutters*, the act or process of welding a piece of steel on that part of a cutting instr. which is to receive the edge. STEELED, pp. *stēld*: ADJ. hardened; made insensible. STEELY, a. *stēl'ī*, having the character or qualities of steel; in *OE.*, made with steel; hard; unfeeling. STEEL-CLAD, a. covered or armed with steel. STEEL-HEARTED, a. *figuratively*, having the heart as hard as steel. STEEL-PEN, a pen-nib made of metal, now in general use for writing with. STEEL-TOYS, technical term among Eng. manufacturers, denoting small articles of polished steel, such as corkscrews, buckles, button-hooks for shoes, etc. BLISTER-STEEL, steel made by interlaying wrought-iron with charcoal and keeping it for some days at high temperature. CAST-STEEL, steel made by mixing iron or steel with powdered charcoal and then melting it, which, when cast into bars, may be rolled or hammered.—*Steel* is a variety of Iron (q.v.) in which the iron is in alloy with an iron carbide. It is capable of being *tempered*, and thus fitted for the finest uses. It is familiarly known that when S. is heated to redness and plunged into cold water, or otherwise suddenly cooled, it becomes very hard and brittle: see ANNEALING. On its being again heated to redness and cooled slowly, the original softness and malleability are restored; again heated even far below redness and then suddenly cooled, it is also softened, the degree of softness being, within certain limits, inversely proportioned to the temperature. When the S., before being reheated, has its surface brightened, it will in the process of reheating present a succession of characteristic colors corresponding to different temperatures, and these colors are so constant and definite

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that they render the use of thermometric instruments unnecessary. The following table gives the colors in the order of their appearance, with the temperatures accompanying:

| TEMP. FAHR. | Color. | Uses of the Steel. |
|-------------|--|---------------------------------------|
| 430° | Very pale yellow.... | Lancets. |
| 450 | Pale straw..... | Best razors and surgical instruments. |
| 470 | Full yellow..... | Common razors, penknives, etc. |
| 490 | Brown..... | Scissors, cold chisels, hoes, etc. |
| 510 ... | Brown dappled with purple spots | Axes, plane-irons, etc. |
| 530 | Purple..... | Table-knives, large shears. |
| 550 | Bright blue..... | Swords, watch-springs, etc. |
| 560 | Full blue..... | Fine saws, augers, etc. |
| 600 | Dark blue..... | Hand and pit saws. |

S. expands very sensibly when hardened: its specific gravity is thus reduced: the change in volume varies according to the temperature to which the S. is heated previous to cooling. Another remarkable fact is that, when steel is hardened at a very high temperature, its tenacity and elasticity are impaired: it becomes exceedingly brittle. S. hardened at a cherry-red temperature in cold water presents a velvety dull fracture, with very fine grain: a higher temperature enlarges the grain.—See further, IRON: MINING: BESSEMER STEEL: KRUPP'S STEEL.

Steel Manufacture in the United States.—In 1880 the manufacture was carried on in 14 states, and the production in ingots or direct castings was 1,145,711 tons. In 1890 steel-works were located in 19 states, and the production was 4,466,926 tons—an increase of 3,321,215 tons, or 290 per cent. Penn. ranked 1st in production, Ill. 2d, and O. 3d, in both years; W. Va. had no works 1880 and ranked 4th 1890; N. Y. was 4th 1880 and 5th 1890; Mass. was 6th both years; N. J. was 5th 1880 and 7th 1890; Colo. had no works 1880 and ranked 8th 1890; Cal. had no works 1880 and ranked 9th 1890; and Mich. had no works 1880 and ranked 10th 1890. The number of steel-works was (1880) 73, (1890) 158; productions of all kinds were (1880) 1,145,711 tons, (1890) 4,466,926. The product of Bessemer-steel ingots or direct castings, by the Bessemer process proper and the Clapp-Griffiths and Robert-Bessemer modifications, was (1880) 985,208 tons in 5 states, and (1901) 8,713,302 tons in 16 states; Penn. making 4,293,439 tons, O. 2,154,846 tons, Ind. and Ill. 1,324,217 tons. Bessemer-steel rails to amount of 741,475 tons were made in 6 states (1880), and to amount of 2,836,273 tons in 7 states (1901). The increase in Bessemer-steel plants was from 11 (1880) to 18 (1901). For production of open-hearth steel there were 25 plants in 10 states (1880), and 90 plants in 14 states (1901), increase in production, from 84,302 tons (1880) to 4,656,309 (1901) a decrease of 4 works and 3 states in 1900. New England's production (170,876) was more than double that of 1900. The manufacture of crucible steel showed increase in the 20 years—viz., 9 states and 76,201 tons product (1880); 11 states and 85,536 tons product (1890), 9 states and 100,562 tons (1900). Basic steel was made in the United States, first as an experiment 1884 and as a commercial product 1888. There

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were basic plants 1901 in more than 10 states total product 94,941 tons. 1901 was the greatest steel-producing year in the history of the United States, and for the first time the open hearth steel production exceeded that of Great Britain.

STEELBOW, *stēl'bow*, in Scotch Law: goods, such as corn, cattle, straw, and implements of husbandry, delivered by the landlord to his tenant, by means of which the latter is enabled to stock and work the farm, being bound to return articles equal in quantity and quality at expiration of the lease.

STEELE, *stēl*, FREDERICK: soldier: 1819, Jan. 14—1868, Jan. 12; b. Delhi, N. Y. He graduated from West Point 1843, served in the Mexican war, was brevetted for gallantry at Contreras and Chapultepec, and was afterward at various points in the west. In the civil war he served in Mo. and Ark.; was in the Yazoo expedition and the Vicksburg campaign; was prominent in the capture of Little Rock, and was in command of a division in the Mobile campaign. After being in command of various districts, he was in charge of the dept. of the Columbia 1865-67. He was promoted col. in the vol. force 1861, brig.gen. and maj.gen. vols. 1862; and at the close of the war he was brevetted brig.gen. and maj.gen. U. S. army. At the time of his death, while on leave of absence at San Mateo, Cal., he was col. of the 20th infantry.

STEELE, Sir RICHARD: 1672-1729, Sep. 1; b. Dublin. His father, sec. to the Duke of Ormond, was of English family; his mother was Irish, and from her the son appears to have inherited the impulsive ardor, tenderness, bright fancy, and reckless profusion immemorially ascribed to the Irish national character. He was educated at the Charterhouse School, with his illustrious friend Addison, and thence was removed to Merton College, Oxford. Leaving college without taking a degree, he enlisted in the horse guards, for which imprudence he was disinherited by a rich relation of his mother, who had named him as heir to an estate in Wexford. In the army he rose to the rank of capt., but was gay, thoughtless, and dissipated—always sinning and repenting, as he himself confesses. To impose a check on his irregularities, he wrote a religious treatise, *The Christian Hero*, published 1701, the design of which was to show that no principles but those of religion are sufficient to make a great man. This public profession of seriousness had little effect on the volatile captain, and he next took to writing comedies. In 1702 he produced *The Funeral, or Grief à la Mode*; in 1703, *The Tender Husband*; in 1704, *The Lying Lover*—the last a failure. About the same time he obtained some fortune by marrying a W. Indian lady, who survived the marriage only a few months; and 1706 he got the appointment of gazetteer, with a salary of £300 per annum, and also the post of gentleman usher to Prince George, which added another £100 to his income. In the following year (1707, Sep. 9) he married a Welsh lady, Mary Scurlock, who figures

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conspicuously in his correspondence as the 'Dearest being on earth,' 'Dear Prue,' and 'Dear wife,' to whom he addressed about 400 letters—admiring, apologetic, and passionate. A course of extravagance—town and country houses, horses and chariots—soon involved the pair in difficulties. Mrs. Steele had a fortune of £400 a year, and was thrifty; but the lady's mother had a life-interest in the estate, and was hard and uncongenial. Addison gave a loan of £1,000, which was repaid within a twelvemonth; but he made other advances, secured by a bond on house and furniture. He put the bond in execution, sold the house and furniture, and remitted the surplus to his imprudent friend. For this seeming harshness Addison has been blamed; but it rests on good authority that the sufferer himself entertained no such feeling: he regarded the incident as a warning meant to do him service, and he met his friend again with his wonted composure and gayety. In 1709 S. commenced *The Tatler*, a periodical published thrice a week, containing short essays on life and manners, town-gossip or *tattle*, and articles of foreign and domestic news; for which S.'s appointment of gazetteer furnished him with peculiar facilities. Addison joined cordially in this publication, and still more effectively in its successor, *The Spectator*, a daily literary journal of higher tone, which was continued with unexampled success through 635 numbers. A third miscellany of the same kind, *The Guardian*, was extended to 175 numbers. S. afterward attempted other periodicals, *The Lover*, *The Reader*, etc., but these were short-lived. His fame rests on his essays in the *Tatler*, *Spectator*, and *Guardian*, to which he contributed respectively 188, 240, and 82 papers. In the keen political strife of that venal age, S. fought courageously and honestly for the Hanover succession and whig principles. He lost his office of gazetteer, and was expelled from the house of commons, for writing a pamphlet called *The Crisis*, in which he warned the nation that the Protestant cause was in danger. But when Queen Anne died, and the whigs were again triumphant, S. participated in the royal favor. He obtained an appointment in the king's household, was elected M.P. for Boroughbridge, and received the honor of knighthood. In 1717 S. was nominated one of the commissioners for the forfeited estates in Scotland, and he seems to have made four annual visits to Edinburgh on the business of this commission. He was led into a controversy with Addison, a few weeks before Addison's death, on the once-famous Peerage Bill—a proposal by ministers for restraining the king from any new creation of peers, except on the extinction of an old family. On this question S. took the side of the crown, and fairly beat his opponent in argument and in temper, besides enjoying the triumph of seeing the bill thrown out. The friends, alas! met no more. The survivor struggled on among controversies, embarrassments, and lawsuits; he was patentee of Drury Lane Theatre; and 1722 he produced his admirable and successful comedy of *The Conscious Lovers*. His health now rapidly failed. His wife had died

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718. He had children to solace his decline. His last three years were spent in retirement in Wales, and he died at Llangunnor, near Carmarthen.

The essays of S. have eclipsed his dramas. His Bickerstaff, the Spectator Club, allegories, and short tales have the true, ever-living, dramatic spirit. In taste and delicate humor, he was greatly inferior to Addison; but in invention and insight into human character and motives, he was fully his equal. He knew the world better, and he sympathized with almost every phase of life and character except meanness and cruelty. He seems to have considered it his special mission to reform the minor vices and absurdities of English society. If his satire had been more keen and trenchant, or his moral lessons more formal and didactic, he could not have succeeded as he did; his essays were just adapted to the times—they insinuated morality and benevolence, and supplied innocent enjoyment mingled with instruction. The lively, natural writer and companion is never lost in the teacher, nor the gay captain of horse wholly absorbed in the author.

STEELL, *stēl*, Sir JOHN, R.S.A.: Scottish sculptor; 1804–1891, Sep. 15; b. Aberdeen; son of a carver and gilder in Edinburgh. He received his education as an artist at the Edinburgh Acad., and at Rome. In 1832, he modelled a fine group of *Alexander and Bucephalus*, which, 50 years afterward, was cast in bronze, and was erected in Edinburgh 1884. The promise of this early work he fulfilled; and has a place in the front rank of his profession. His chief works are in Edinburgh: the colossal figure of the queen crowning the front of the Royal Institution; the statue of Walter Scott in the Scott monument, a commission won in competition; the equestrian statue of the Duke of Wellington (1852); statues of Prof. Wilson, and of Allan Ramsay (1865); and the equestrian statue of Prince Albert, at the inauguration of which, 1876, S. was knighted.

STEELTON, *stēl'ton*: town in Dauphin co., Penn.; on the Pennsylvania and the Philadelphia and Reading railroads; 3 m. e. of Harrisburg. Its nucleus was the Pennsylvania Bessemer steel-works, around which a thrifty community soon gathered. In 1866 a town was laid out, named first Baldwin, then Steel-Works, and, on its incorporation 1880, Steelton. In 1867 the manufacture of steel ingots was begun, 1868 a rail-mill was completed, 1872 the erection of blast furnaces was begun, 1876 a blooming-mill was finished, and since then the works have been developed till they have become the largest of their kind in the country. The town has several churches, a model graded public school, and 3 weekly periodicals. Pop. (1880) 2,447; (1890) 9,250; (1900) 12,086.

STEELYARD, n. *stēl'yârd*, colloq. *stīl'yerd* [from *steel* and *yard*]: balance for weighing bodies, consisting of a single weight shifted forward and backward on a graduated beam; see BALANCE.

STEEN—STEEP.

STEEN, v. *stēn* [AS. *stán*, a stone]: in *arch.*, to line with dry brick, stone, or other material, as a well or cess-pool: N. a brick or stone wall, or the lining of a well. **STEEN'ING**, imp.: N. the act of building with bricks or stones without mortar in the lining of wells, etc. **STEENED**, pp. *stēnd*.

STEEN, *stān*, JAN HAVICKSZ: Dutch painter: 1626-79; b. Leyden, where his father was a brewer. His early predilection for art led to his being apprenticed to a German painter, Nicholas Knupfer of Utrecht. Subsequently he became a pupil of Van Goyen, whose daughter Margaret he married. Very soon his repute became established. As he worked in a slow and elaborate manner, his gains were insufficient, and he started a brewery at Delft. This enterprise promised fairly; but, according to tradition, he was not of steady business habits, and became so affected with his own beer that soon he brewed no more of it. Little is known regarding his subsequent life, though many unauthenticated anecdotes are current which present him as a drunkard; but a late biographer, Van Westrheene, throws doubt on all such statements, which are indeed scarcely credible in view of his industry. His catalogued works number nearly 500. His death left his family destitute.

As an artist of the Dutch school he ranks high; and his works are now much valued. In humor and spirit they are scarcely surpassed; and their coloring is clear, fresh, and delicate. At times he attempted historical subjects, in which his success was not great. It was in homely and domestic scenes that his genius showed itself; in this field he has scarcely been equalled.

STEEP, v. *stēp* [Icel. *steypa*, to throw down, to pour out: Sw. *stōpa*, to steep, to sink]: to soak in a liquid; to imbue: N. the liquid in which a thing may be soaked; that which is soaked in a liquid; a rennet-bag. **STEEP'ING**, imp.: N. the process by which anything is soaked in a liquid. **STEEPED**, pp. *stēpt*: **ADJ.** soaked in a liquid. **STEEP'ER**, n. *-ēr*, one who or that which steeps; a vessel in which things are steeped.

STEEP, a. *stēp* [Icel. *steypa*, to cast or throw down: Sw. *stupa*, to incline, to lower: Norw. *stup*, a steep cliff]: ascending or descending with a great inclination or slope; precipitous: N. a hill, mountain, or rock having a great inclination or slope. **STEEP'LY**, ad. *-lī*, in a steep manner. **STEEP'NESS**, n. *-nēs*, the state of being steep or precipitous. **STEEP'Y**, a. *-ī*, having a steep or precipitous declivity. **STEEP-DOWN**, a. deep and precipitous. **STEEPEN**, v. *stēp'n*, to become steep. **STEEPENING**, imp. *stēp'nīng*. **STEEP-ENED**, pp. *stēp'nd*. *Note.*—The two preceding entries are closely connected. 'The sense of *soaking* is incidental to that of *dipping*, and from the idea of *dipping* or *tumbling* to that of *steepness* or *abrupt inclination* is an easy step'—see Wedgwood.

STEEPLE—STEER.

STEEPLE, n. *stē'pl* [AS. *stypel*, a tower: Sw. *stapel*, a heap, a pile: Norw. *stupel*, a clock-tower: Low Ger. *stipel*, a prop, a pillar]: tower and spire, lantern, or other superstructure attached to a church, or other public building; a spire. **STEEPLED**, a. *stē'pld*, furnished with a steeple. **STEEPLE-HOUSE**, in *OE.*, contemptuous name for a church.

STEEPLECHASE, *stē'pl-chās*: race on horseback, not on a prepared course, but across fields, hedges, ditches, and obstacles of every kind that may happen to be in the way. The name and practice both are said to have originated in England in a party of unsuccessful fox hunters, on their return home, agreeing to try a race toward the steeple of a village church, the first who could touch the church with his whip to be the winner. This kind of sport soon became popular; and matches were made and sweepstakes entered into—the requirements of the course being simply two flagstuffs placed about two miles apart, from one of which the competitors started, made their way to the other, and returned to the starting point. Each rider was allowed to go and come as he chose, but the country was often selected on account of its difficulty; high and strong fences, deep and broad ditches, sometimes even swollen rivers having to be crossed and recrossed. About the end of the 18th c. was developed the more regular steeplechase of modern times over a course marked out by flags, between which the rider must pass to win the race; and 1841 *handicapping* began. This consists in weighting of horses according to their supposed merits, without reference to age, size, or sex. The first handicap steeplechase was run at Newport Pagnell, 1841, April 20; and the sport has since become increasingly popular in England, most of the spring and autumn meetings having their steeplechases for valuable stakes. Great crowds are drawn by the danger of the sport. Serious accidents are not rare; and great courage, coolness, resolution, and judgment are requisite in the rider.—The name is applied also to similar races for men. **STEEPLECHASER**, rider in a steeplechase; horse trained for such riding.

STEEPLE-JACK, n.: man who climbs steeples and tall chimneys to effect small repairs, or to erect scaffolding.

STEER, v. *stēr* [AS. *styrān*, to move, to stir: Icel. *styra*, to guide, to steer; *staurr*, a stake or pole: Dut. *sturen*; Dan. *styre*; Ger. *steuern*, to steer: Gael. *stiuir*, to guide, to steer]: to direct; to guide; to direct and govern the course of a ship by the helm; to be directed and governed; to pursue a course. **STEER'ING**, imp.: N. the act of directing a ship in its course by the helm. **STEERED**, pp. *stērd*. **STEERAGE**, n. *stēr'āj*, the steering of a ship; the manner in which a ship answers to the helm; the forepart of a ship, and the cabin there situated, for passengers paying a lower rate of fares. **STEER'ER**, n. *-ēr*, one who steers. **STEER-**

GE-WAY, that degree of forward movement which renders a ship governable by the helm. **STEERING-WHEEL**, the wheel by which a ship's rudder is turned and the ship steered. **STEERSMAN**, n. *stērz'mān*, one who steers a ship. —*Steering* in large steam-vessels is now done largely by aid

STEER—STEEVE.

of machinery Various steam steering engines have been invented and have received more or less extensive application. The general theory involves the use of a steam engine without dead-point to rotate the rudder shaft, and the motions of the engine are controlled by a hand-steering wheel. It is obvious that if the steering wheel opened or closed an ordinary steam throttle-valve there would not be connection between the number of degrees of rotation given it and the motion of the engine and rudder. The desired interdependence of these motions has been obtained in various ways. In Sickel's steam-steering apparatus, introduced 1860, the slide-valves are worked by eccentrics carried and fixed on a special disconnected shaft. This shaft is turned by the steering-wheel, so that each revolution of the eccentric shaft produces one revolution of the engine. In Jos. P. Manton's and in G. W. Baird's apparatus the motion of the engine is caused to actuate mechanism, differing in detail in the two machines, for automatically cutting off the steam. The steering-wheel if turned admits steam; the engine then rotates, and as it does so, gradually cuts off steam and comes to rest. Any desired ratio between the amount of engine motion and movement of steering-wheel can thus be secured. The other general features of steam-steering engines are the use of two cylinders inclined to each other to avoid the dead-point, and some quick means of disconnecting the steam apparatus and returning to the ordinary mechanical or hand-steering process if desired: the latter feature provides for accident to the more or less delicate steam-gear. In war-ships the steering arrangements are kept as far as possible below the water-line. The use of steam-steering gear greatly contributes to the facility of working a vessel. On the U. S. monitor *Roanoke* it took two men two minutes to move the rudder from one extreme position to the other, with 19 revolutions of the wheel. With steam-gear one man with three and one half revolutions of the wheel wrought the same evolution in five seconds. In enabling larger rudders to be used, and by the steam cushioning provided by the normal steam-piston and cylinder action, the improvement is very marked.

STEER, n. *stēr* [Gael. *stair*, noise, confusion (see STIR)] in *Scot.*, confused noise: disturbance, tumult.

STEER n. *stēr* or STIRK, n. *stērk* [Bav. *ster*, the male sheep or hog; Gael. *stuir*, a male calf; Dut. and Ger. *stier*, a bull; AS. *styric*, heifer]: a young castrated male of the ox kind: a young bull or ox.

STEEVE, n. *stēv* [probably a corruption of STAFF or STAVE, which see; O. Dut. *steve*, a staff]: among *seamen*, the angle which a bowsprit makes with the horizon, or with the line of a vessel's keel, a long heavy spar with a place to fit a block at one end, used in stowing cargo closely together: V. to elevate at an angle with the horizon, or with the line of a vessel's keel; to make such an angle. STEEVING, imp.: N. the angle of elevation which a ship's bowsprit makes with the horizon. STEVED, pp. *stēvd*.

STEEVENS—STEIN.

STEEVENS, *stē'venz*, GEORGE: critic and editor of Shakespeare: 1736, May 10—1800, Jan. 22; b. Stepney, then a London suburb. He was educated at Eton School and at Cambridge. He published (4 vols. 1766) *Twenty of the Plays of Shakespeare, being the whole Number printed in Quarto during his Lifetime*; and was associated with Dr. Samuel Johnson in preparing the ed. of Shakespeare's plays pub. 1773. Later, S., in association with Isaac Reed, issued 2 new editions, 10 and 15 vols. respectively: thus was the standard of Shakespeare's text fixed for at least 50 years. After his death his library, parcelled in 1,943 lots, was sold at auction for about \$13,500 (£2,740).

STEG, n. *stĕg* [Icel. *steggr*, a male in general (see **STAG**)]: in *prov. Eng.*, a gander.

STEGANOGRAPHY, n. *stĕg a-nĕg'ră-fĭ* [Gr. *steg'ānos*, covered, concealed—from *stegō*, I cover; *graphō*, I write]: a mode of writing by a choice of characters, known only to the initiated, and which depends on no rule; the art of writing in cipher; the art of writing in shorthand.

STEGNOSIS, n. *stĕg-nō's.s* [Gr.—from *stegnōō*, I make thick, I make costive]: constipation. **STEGNOTIC**, a. *-nōt'ik*, binding; constipating: N. an astringent.

STEIK, or **STEEK**, v. *stĕk* [see **STITCH**]: in *Scot.*, to close or fasten the door; to shut; to stitch: N. a stitch. **STEIK'ING**, imp. **STEIKED**, pp. *stĕkt*, shut up; fastened and closed securely.

STEIN, *stĭn*, CHARLOTTE ALBERTINE ERNESTINE VON: 1742, Dec. 25—1827, Jan. 6; b. Weimar: friend and correspondent of Goethe. She was daughter of court-marshal Von Schardt, and wife of Baron Friedrich von Stein. Her beauty was of character and manner rather than of person. The friendship with Goethe was very intimate from near 1775 to 1788, when he formed an attachment to a domestic, who afterward became his wife; but there was no utter alienation. His letters to her were published 1848. Some of hers to various persons have been printed; also a tragedy by her in prose, entitled *Dido*, supposed to shadow forth her experience; but Schiller, writing 1787, speaks of her relations with the great poet as purely platonic, although she had received from him a thousand letters. She died at Weimar. See *New York Sun*, 1890, Jan. 26, for full biography.

STEIN, *stĭn*, HEINRICH FRIEDRICH KARL, Baron VON UND ZUM: one of the greatest statesmen that ever conducted Prussian affairs: 1757, Oct. 26—1831, June 29; b. Nassau; of an old Rhenish-Franconian family. He studied at Göttingen 1773 to 77, entered the service of Prussia 1778; and 1784, had risen to the head of the dept. of mines for Westphalia. In 1786, he visited England, and studied its institutions, which he much admired. He was appointed, 1797, pres. of the Westphalian chambers. In 1804, he entered the Prussian ministry as chief of the dept. of indirect imposts, taxes, manufactures, and commerce. In this capacity he effected important ameliorations, particularly by removing restrictions on internal trade; yet he found

STEINBOK.

himself incapable of modifying the policy that resulted in the French invasion and conquest. S., though politically and religiously conservative, was strongly opposed to bureaucracy and military despotism, while recognizing in the self-governing powers of communities and provinces the only practical guarantee of national liberty, yet, as a baron of the empire, he was hostile to the anarchic sovereignty of little states; thus his political position procured for him many adversaries and few friends. In 1807, he was dismissed from office by the king, and withdrew to his estate in Nassau; but the peace of Tilsit opened the eyes of his sovereign to the wisdom of S.'s policy, and in less than seven months he was recalled, with the approbation of Napoleon, who had as yet no idea of S.'s deep and earnest patriotism. S.'s industry was untiring. Seeing clearly that, in a military view, Prussia was powerless for the moment, he set about developing her internal resources by a series of administrative and political reforms, known as *Stein's System*—the principal of which were abolition of serfage, with indemnification to the territorial lords; subjection of the nobles to manorial imposts; equality of orders in the sight of the law; universal obligation of military service; promotion in the state by merit alone, without distinction of caste; and establishment of a municipal system analogous to that of England. Some of these reforms were carried out by S., and others by his successor Hardenberg (q.v.). Meanwhile, he had become suspected by Napoleon; and an intercepted letter from S. was brought to the French emperor, in which his policy was sharply criticised. S. was obliged to resign (1808), and retired to Austria, where he became the centre of a secret national society, the *Thugendbund*. Napoleon, who bitterly hated patriots that stood in his way, confiscated his property. In 1812, S. was summoned to Russia by Emperor Alexander, and contributed by his counsels to prepare the coalition against Napoleon. After the march of the allies into Saxony, he was appointed pres. of the council of all the German States; was a leader in all the military diplomacy of that stirring time till the congresses of Vienna and Aix-la-Chapelle, in which, however, he took no part, owing to the intrigues of the Bavarian minister, acting for the lesser states of Germany: those states knew well that S. did not look with a favorable eye on their anarchic autonomy. The absolutists also were against him. S. thereafter had some honorable functions, but no power, and died at Frücht. S. was the great forerunner of Bismarck—seeing afar through the mists which no other eye penetrated, both the need and the possibility of German unity, and tenaciously keeping his course thitherward.—See Pertz's *Leben des Freiherrn von Stein* (1855); Prof. Seeley's *Life and Times of S.* (1879). His correspondence with Humboldt, Gneisenau, Eichhorn, Niebuhr, etc., is extremely valuable for the political history of the period.

STEIN'BOK: see BOUQUETIN.

STEINITZ—STELA.

STEINITZ, *stī'nīts*, **WILHELM**: chess-player: b. Prague, 1837, May 18. He was educated in the schools of his native town and in the Polytechnicum at Vienna. At the Dublin Chess Congress 1865 he won the first prize, and 1866 beat the then champion, Prof. Anderssen, by winning 8 games out of 14: thus S. became the chess champion of the world, a distinction which he retained until 1894 and had gained every single-handed match or series played from 1862, and either 1st or 2d place (or been tied for 1st or 2d) in every tournament in which he had played since 1867. His aver. score in tournaments had been the highest, and in any single one his score was always the best. Among the great chess-players with whom he had contended for the mastery were Blackburne, Bird, Zuckertort, Martinez, Mackenzie, Tschigorin, Golmayo, Vasquez, and Gunsberg. He came to the U. S. in 1883. He died 1900, Aug. 12.

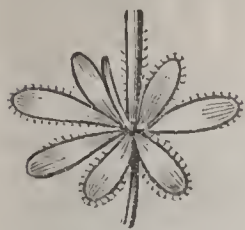
STEINKIRK, n. *stīn'kérk*, or **STEENKIRK**, n. *stēn'kérk*: name brought into fashion, after the battle of Steinkirk, 1692, for sundry articles, especially of dress.

STEINMETZ, *stīn'mětz*, **KARL FRIEDRICH VON**: soldier: 1796, Dec. 27—1877, Aug. 4; b. Eisenach in Saxe-Weimar. Having passed through a military school, he entered the Prussian army as lieut. 1813, and served in the wars against Napoleon, being several times wounded, and winning the order of the Iron Cross. In the street-fighting in Berlin 1848 S. commanded a regt.; he was commissioned col. 1851, maj.gen. 1854, lieut.gen. 1858: he was in command of an army corps (1862). In the Austro-Prussian war (1866) S., commanding the 5th corps, defeated 3 different Austrian corps in 4 days. In the Franco-Prussian war (1870-1) S. commanded the first army against Bazaine at Metz; but owing to dissensions between him and Moltke, as to the plan of campaign, etc., S. was superseded in the command, and named gov. of Posen and Silesia. He was promoted field-marshal 1871, April 8. S. was harsh and testy of temper, but he was a faithful officer, of Spartan austerity toward himself, and a most efficient corps commander.

STEINWEHR, *stīn'wār*, **ADOLPH WILHELM AUGUST FRIEDRICH**, Baron **VON**: soldier: 1822, Sep. 25—1877, Feb. 25; b. Blankenburg, Brunswick, Germany. He was educated at the milit. acad. of Brunswick. In 1854 he emigrated to the U. S., and at the beginning of the civil war, raised and was commissioned col. of the 29th N. Y. regt. 1864, Oct. 12, he was made brig.gen. of vols., and given command of the 2d division under Sigel and afterward under Howard. He was in the campaign on the Rapidan and Rappahannock and in the battles of Chancellorsville and Gettysburg. He died at Buffalo, N. Y.

STELA, n. *stē'lā* [L. *stēla*, a pillar—from Gr. *stēnē* post or slab]: a small column or pillar without base or capital, used as a monument, a milestone, etc. **STELAE** *stē'lē*, a sepulchral slab or column. **STÉ'LENE**, a. *-lēn*, used as a stela; columnar.

STELLAR—STEM.



STELLAR, a. *stě'l'ěr*, or **STEL'LARY**, a. -*ĩ* [L. *stella*, a star: It. *stellare*, stellar]: starry; relating to stars; full of stars. **STEL'LATE**, a. -*lăt*, or **STEL'LIFORM**, a. -*lĩ-faworm* [L. *forma*, a shape]: in *bot.*, resembling a star; arranged like a star. **STEL'LATED**, a. -*lăt-těd*, radiated; resembling a star; having the fibres, crystals, or members diverging in all directions from a common centre.

Stellate Leaves. **STELLED**, a. *stě'l'ěd*, in *OE.*, starry. **STEL-LIF'EROUS**, a. -*lĩf'ěr-ūs* [L. *fero*, I produce]: having or abounding with stars.

STELLA'RIA: see **STITCHWORT**.

STEL'LERINE: see **RHYTINA STELLERI**: also **MANATIDÆ**.

STELLIONATE, n. *stě'l'ĩ-ō-năt* [L. *stellĩo* or *stellĩonem*, a lizard, a knavish person]: in *law*, the fraudulent sale of a thing otherwise than it is; the fraudulent sale of the property of another as if it were one's own.

STELLITE, n. *stě'l'ĩt* [L. *stella*, a star; Gr. *lithos*, a stone]: a white translucent mineral of a silky appearance, occurring in stellar groups in greenstone.

STELLULÆ, n. plu. *stě'l'ũ-lě* [dim. of L. *stella*, a star]: in *anat.*, a name given to any cluster of small veins or vessels which have a stellate arrangement. **STEL'LULAR**, a. -*ũ lěr*, shaped like little stars; having marks resembling stars.

STELVIO, *stě'l'vě-ō*, **PASS OF THE** (Ger. *Stilfserjoch*): highest carriage-road in Europe (9,176 ft. above sea-level); leading from Bormio, on the Italian side of the Tyrolese Alps, near the head of the Valteline, to Glurns on the Austrian side. It forms part of the great road between Milan and Innsbruck, and was completed by the Austrian govt. 1828, at an expense of 3,000,000 florins. The boldness of its design, the difficulties of its construction, and the grandeur of its scenery make this the most remarkable road in Europe.

STEM, n. *stěm* [AS. *stenn*; Ger. *stamm*, the stem or trunk of a tree: Dut. *stam*, a trunk, stem, stock: Dan. *stamme*, the trunk of a tree]: the body of a tree or plant from which the branches or offshoots grow; the stalk (see below): the stock of a family; race; progeny; in *music*, the line joined to the body of a note. **STEM'LESS**, a. -*lěs*, without a stem.

STEM, v. *stěm* [Icel. *stemma*, to stop, to close: Ger. *stemmen*, to stick something against an object with a sudden thrust: Dan. *stemme*, to stem]: to put a stop to; to resist; to make progress against, as a current. **STEM'MING**, imp. **STEMMED**, pp. *stěmđ*.

STEM, v. *stěm* [Icel. *stefna* or *stemna*, to turn the stem or rudder: Norw. *stemna*, course, direction (see **STEM** 1 and 2): in *OE.*, to move in a certain direction; to steer: N. a number of ships coming at an appointed time; in *Cornwall*, an appointed task; a day's work. **STEM'MING**, imp. **STEMMED**, pp. *stěmđ*.

STEM—STEMMATA.

STEM, n. *stēm* [Norw. *stemma*, the stem or prow of a vessel—same word as STEM 1]: the strong curved timber to which the two sides of a ship are united in front, the whole having a wedge-like appearance; the prow. This strong piece or combination of timber is scarfed to the fore-end of the keel, and rises nearly perpendicularly to form the bow and cutwater: to it are rabbeted the fore-ends of the planks. It is backed by an equally strong timber called the Stenson, bearing the same relation to it as the Keelson (q.v.) to the keel (see SHIP-BUILDING). STEM, v. in *OE.*, to move forward as a ship with its stem. STEM'-MING, imp. moving forward with the stem. STEMMED, pp. *stēmd.* FROM STEM TO STERN, the whole length of a ship.

STEM, in Botany: that part of the plant which, arising from the surface of the ground, and shooting upward as the root shoots downward, bears the leaves and flowers. Stems are either single or branched. They are herbaceous or woody, solid or hollow, jointed or unjointed. Sometimes they are weak so as to be procumbent, though usually firm and erect; sometimes weak stems are twining, or they are upheld in various other ways by the climbing habit of the plant. Stems are generally round, but sometimes compressed or angular. The arrangement of the leaves and branches, in reference to the stem, is symmetrical, but plants differ from each other in the nature of this arrangement. In the branching of trees, the symmetrical arrangement is often lost, as to the principal branches, by the death of some of them. In many plants the stem is obsolete, or so abbreviated as to be inconspicuous, forming a mere neck—the *crown of the root*—where the leaves and flower-stalks spring as at once from the root. Very important differences in the structure of stems distinguish the three great classes of plants—Acrogenous (q.v.) Endogenous (q.v.), and Exogenous (q.v.). Stems sometimes creep along the ground, or even under the ground, when they receive the name *rhizome* or *root-stock*; they can be distinguished from true roots, in most cases, by their joints, or by scales (undeveloped leaves), or scars of stems and leaves.

STEMBEL, *stēm'bēl*, ROGER N.: naval officer: born Md., 1810, Dec. 27. He became a midshipman in the navy 1832, and reached the rank of lieut. 1843. During the civil war he rendered important service at various points, commanded the *Cincinnati* in a desperate engagement 1862, and received commendation for both skill and gallantry. After the war he was connected with the European squadron. He was promoted commander 1861, captain 1866, commodore 1870, was retired 1872, and became rear admiral on the retired list 1874, June 5.

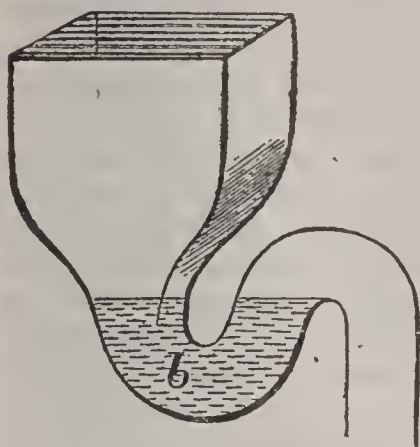
STEMMATA, n. plu. *stēm'mă-tă* [Gr. *stemma*, a garland, *stemmăta*, garlands—from *stephō*, I encircle]: in *zool.*, the simple eyes or ocelli of certain animals, such as insects and spiders.

STEMPLES—STENO.

STEMPLES, n. *stēm'plz* [a probable dim. of *stems* or *steps*]: in certain mining districts, pieces of wood fixed in the sides of the shaft by which an ascent or descent can be made.

STENCH, n. *stěns̄h* [OHG. *stinchān*, to smell sweet or

bad: AS. *stenc*, smell: Ger. *stank*; Icel. *stækja*, a stench]: a strong bad smell; offensive odor. STENCH'Y, a. -ī, in *OE.*, having an offensive smell. STENCH-TRAP, in plumbing, a form of drain-opening, which, while allowing liquids to run down, prevents escape of noxious gases arising from sewers, etc. It is of iron or earthenware, in great variety of forms, but on one very simple principle, there being a curved or siphon pipe below the grating or grid (fig.), which always retains



Stench-trap.

sufficient water, *b*, to prevent the outward passage of the gases. The water thus forms a 'seal.' It is absolutely imperative, for health, that each opening from a room into a drain or a sewer should have one—and generally more—of these fixtures.

STENCIL, n. *stěn'sil* [probably from OF. *estinceller*, to sparkle, as given by Skeat (see TINSEL)]: thin piece of pasteboard or leather, or a thin plate of metal, in which the outlines of any figures are cut out, used to paint or mark in colors by passing a brush of color over it while lying on paper or placed against a wall—the plate shutting off the color from all but the spaces cut out: it is a rapid and cheap process in wall-decoration: V. to paint or ornament by means of a stencil. STEN'CILLING, imp.: N. the art; the work done. STEN'CILLED, pp. -sīl'd. STEN'CILLER, n. -sīl-ēr, one who stencils.

STENDAL, *stěn'dāl*: town of Prussian Saxony, 38 m. n.n.e. of Magdeburg. It has manufactures of woollens, cottons, tapestries, stoves, machinery, tobacco, gloves, etc. Pop. (1885) 16,184.

STENO-, prefix, *stěn-ō*, or **STEN-** [Gr. *stenos*, in a narrow compass]: small; narrow; confined; in a small compass.

STENO, *stā'nō*, **NICHOLAS**: distinguished anatomist and geologist: 1638–87, Nov. 25; b. Copenhagen. He had long been famed for his anatomical discoveries, when, 1667, he applied himself to geology, and has been regarded as the father of paleontological science. He lived much in Italy, and became a Rom. Catholic. Latterly he wrote several religious and controversial works, and was made a bishop *in partibus* by the pope. He died at Schwerin. See *Nature*, xxv.

STENOGRAPHY—STEPHANITE.

STENOGRAPHY, n. *stěn-ög'ră-fĩ* [Gr. *stenos*, narrow; *graphō*, I write]: the art of writing very expeditiously by using simple signs and abbreviations; Shorthand (q.v.). **STENOGRAPHIC**, a. *stěn'ō-grăf'ik*, or **STEN'OGRAPH'ICAL**, a. *-ĩ-kăl*, of or relating to stenography. **STEN'OGRAPH'ICALLY**, ad. *-lĩ*. **STENOGRAPHER**, n. *stěn-ög'ră-fēr*, or **STENOG'RAPHIST**, n. *-ră-fist*, one who is skilled in stenography; a shorthand-writer.

STENOPHYLLOUS, a. *stěn-ōf'ĩ-lūs* [Gr. *stenos*, narrow; *phyllon*, a leaf]: in *bot.*, narrow-leaved.

STENT, n. *stěnt* [OF. *estendre*, to estimate—from mid. L. *extendēre*, to appraise, to estimate—from L. *ex*, out; *tendēre*, to stretch]: in *OE.* and *prov. Eng.*, an allotted portion; a limited right of pasturage; in *Scots law*, a valuation of property in order to taxation; in *Staffordshire*, the day's work of a miner: V. to stretch; to restrain; to estimate with a view to taxation; to assess. **STENT'ING**, imp. **STENT'ED**, pp.

STENT, v.: *OE.* for **STINT** or **STINTED**.

STENTORIAN, a. *stěn-tō'rĩ-ăn* [*Stentōr*, a herald mentioned by Homer who had a voice like thunder]: exceedingly loud and powerful—applied to the voice or lungs.

STEP, n. *stěp* [Dut. *stap*, a step: Icel. *stappa*, to stamp: Russ. *stopa*, sole of the foot]: a forward movement made by one removal of the foot; the space so passed over; one rise of a stair or ladder; a print or impression of the foot; any small space or distance; degree; progression; manner of walking; proceeding; action; the hole or socket into which the end of a mast is inserted when placed upright: V. to make one pace, as in walking; to advance or recede by one movement of the foot; to walk; to go; to walk a short distance. **STEP'PING**, imp.: N. movement by steps. **STEPPED**, pp *stěpt*. **STEPS**, n. plu. a portable flight of stairs, or a self-supporting ladder with flat steps. **STEP-PING-STONE**, a raised stone in a swampy place or in a stream to save the feet in walking; any means of progress. **TO STEP ASIDE**, to walk to a little distance off; to remove but a little way; to err. **TO STEP INTO**, to walk or advance into a place or state. **TO STEP A MAST**, to raise it upright in its socket. **TO TAKE A STEP OR STEPS**, to make a movement in a given direction. **STEP BY STEP**, by a gradual and regular process.

STEP-FATHER, n. *stěp-* [OHG. *stiufan*, to deprive of parents: Icel. *stufr*, a stump; *styfa*, to cut short: O.Sw. *stubbe*, a stump; *stubba*, to cut short]: a father by marriage only. **STEP-MOTHER**, not one's own mother; a mother by marriage. **STEP-BROTHER**, a son of a step-father or mother. **STEP-CHILD**, or **STEP-DAUGHTER**, and **STEP SON**, the child of one's husband or wife by a former marriage. **STEP-SISTER**, the daughter of a step-father or -mother, etc.

STEPHANITE, n. *stěf'ăn-īt* [after Archduke *Stephen* of Austria]: a valuable ore of silver of a dark or lead gray color, called also *black-silver*, occurring in prismatic or tabular crystals in veins in the older rocks.

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STEPHEN, *stē'ven*, Bishop of Rome: (in office about 254–257), successor of Lucius I. His pontificate is memorable in the historical discussions as to the early evidences of a Roman *primacy*. The history of S. is urged as an argument by each party in support of its own view. The advocates of the primacy infer, from several examples of the deposition of bishops by S. in various places, that a power equivalent to the modern primacy of Rome was even then acknowledged. The adversaries of the primacy contend that the resistance to S. offered and maintained by Cyprian (q.v.), on the rebaptizing of heretics, is irreconcilable with the general recognition in the 3rd c. of any supremacy on the part of the bishop of Rome.

STEPHEN III., Pope of Rome: (pope 752–757); b. Rome; d. 757, Apr. [He is numbered in some lists as S. II.: such lists do not reckon the S. II. who died 752, Mar., four days after his election, and before his consecration.] His place is important in the history of the temporal sovereignty of the Roman see. He was in possession of the see during the occupation (which practically dates from 752) of Ravenna, the Exarchate, and the Pentapolis, by Astolphus, King of the Lombards. That king having invaded Rome, and the Byzantine emperor, Constantine Copronymos, having left unheeded the appeals of S. and the Romans for succor, S. had recourse to Pepin, King of the Franks. The latter in vain sent legates to Astolphus; and the pope returned to France with the legates to solicit in person the aid of the Frank monarch, whom he solemnly crowned. Pepin agreed to compel the Lombards to withdraw from these provinces (which formed the portion of the states formerly in occupation of the Roman see, known as the 'Legations'), and to bestow them on the see of Peter. The Lombard king made a promise to that effect; but on Pepin's withdrawal, renewed his pretensions, and marched on Rome. S. therefore recalled Pepin in a most curious letter written in the name and person of St. Peter, an invitation with which Pepin at once complied; and having again forced Astolphus to withdraw, he (notwithstanding a demand from the Byzantine emperor for the restoration of the provinces to the empire) reinstated the Roman see in its sovereign rights.

STEPHEN VII., Pope of Rome: (pope 896–7); d. 897. He has supplied to historians much matter of discussion, from his strange proceedings in disinterring the corpse of his penultimate predecessor, Formosus, stripping it of its pontifical garments, and ordering it to be thrown into the Tiber, as the body of a usurper of the papal throne. The popular tumult which this excited ended in S.'s imprisonment, and his death by strangling.

STEPHEN X., Pope of Rome: (pope 1057–8); d. 1058, Mar. 29. He was one of the remarkable series of reforming popes in the 11th c. who are believed to have been elected under the influence of the renowned Hilde-

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brand, and who, by their energetic rule, prepared the way for that great scheme of ecclesiastical organization of which the pontificate of that eminent man, under the name of Gregory VII. (q.v.), was the final development.

STEPHEN, King of England: 1105–1154, Oct. 25 (reigned 1135–54); b. Blois; third son of Stephen, Count of Blois, by Adèle, or Alise, daughter of William the Conqueror; consequently nephew of Henry I., and cousin of Matilda, daughter of Henry. He was brought over to England at an early age, and became a favorite with his uncle, who bestowed on him large estates, and procured for him a marriage with Mahout, or Matilda, daughter of Eustace, third Count of Boulogne, and younger brother of the famous Godfrey of Bouillon. By this marriage S. inherited the earldom of Boulogne on the death of his father-in-law (1125), and became connected with the royal family of Scotland. When his uncle Henry resolved to settle the crown on his daughter Matilda, whose first husband was Henry V., emperor of Germany (whence she is often spoken of as ‘Empress Maud’), he expected for his project the support of his nephew, and at a council in London, 1127, S., with the other dignitaries of the land, lay and ecclesiastical, took the oath of fealty to Maud. A few months later, the widowed empress married Geoffrey Plantagenet (q.v.). On the death of Henry I. (1135), S. hurried over to England from Normandy, where he had been with his dying uncle, and was soon surrounded by a powerful body of the nobles and clergy, and was crowned at Westminster. His usurpation was confirmed by a bull of Pope Innocent. But S. found his crown a crown of thorns. Although a gallant, generous, handsome prince, immeasurably superior in personal and royal virtues to Maud (who was suspected of having murdered her first husband, and who quarrelled with her second, and was altogether a fiery, insolent, unwise, and exasperating woman), yet on S. rests the responsibility of causing a civil war as sanguinary, if not as protracted, as the famous *Wars of the Roses*. Listen to the *Saxon Chronicle*: ‘In this king’s time, all was dissension and evil and rapine. . . . Thou mightest go a whole day’s journey, and not find a man sitting in a town, nor an acre of land tilled. The poor died of hunger, and those who had been men well-to-do begged for bread. . . . This lasted the 19 years that Stephen was king, and it grew continually worse.’ S., to conciliate the petty barons, allowed them to build castles, of which in all more than a thousand were erected—each a robber-haunt.

In 1141, Feb., after five years of fierce fighting—against David of Scotland, uncle of Maud, who had taken up arms for his niece (see STANDARD, BATTLE OF THE); against Robert, Earl of Gloucester, natural son of the late king Henry, who also had raised the standard of his half-sister; against individual nobles who simply wished to live in anarchic and barbarous independence;

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and finally, against the power of the church, which he vainly sought to diminish—he was taken prisoner by the Earl of Gloucester, and placed in chains in the Castle of Bristol. Maud was now elected queen by her own party, but her rapacity and other bad qualities soon made her rule intolerable, and the wife of the imprisoned S. (also called Maud or Matilda) found it possible to continue the war, by the help of the Londoners, who were stanch adherents of her husband. S. obtained his liberty in exchange for the Earl of Gloucester, who had fallen into the hands of S.'s friends at Winchester; and the war was resumed with greater violence. The death of the Earl of Gloucester, 1146, forced Maud to take refuge in Normandy; but a conspiracy of nobles, headed by Ranulph, Earl of Chester, and another quarrel with the church, kept S.'s hands as full of work as before, and no sooner were these matters settled, than Maud's son, young prince Henry, appeared in England (1153), at the head of an army to support his claim to the throne. Fortunately for the nation, so sadly wasted and desolated, a compromise was effected between the two rivals, which prevented further bloodshed—S. agreeing to acknowledge Henry as his successor. S. died at Dover the year following.

STEPHEN, Sir JAMES FITZJAMES, K.C.S.I., D.C.L.: jurist: 1829, Mar. 3—1894, Mar. 12; son of Sir James S. and bro. of Leslie S. (q.v.). He graduated at Cambridge; was called to the bar 1854, recorder of Newark-on-Trent 1859–68, in the mean time winning great distinction as counsel for the Rev. Roland Williams, accused of heresy; legal member of the council of the gov.gen. of India 1869, Dec.—1872, Apr.: while in India he labored to consolidate, abbreviate, and simplify the laws; prof. of common law 1875–77; judge of the high court of justice 1879, resigning 1891. He was author of numerous treatises on law, and he wrote frequently for reviews, on social and political questions.—His father, Sir JAMES S. (1790, Jan. 3—1859, Sep. 15; b. London), was a barrister, and for many years was colonial sec., showing extraordinary activity, energy, and administrative ability. He was prof. of mod. history in Cambridge 1849 till his death. He wrote for the *Edinburgh Review* on church history and religious opinion. He was author of *Essays in Ecclesiastical Biography* (1849) and *Lectures on the Hist. of France* (1851).

STEPHEN, LESLIE, M.A.: essayist: b. London, 1832, Nov. 28: son of Sir James S., and bro. of Sir James Fitzjames S. (q.v.). He was educated at Eton School, King's Coll. (London), and Cambridge; was for several years fellow of Trinity Hall, Cambridge; edited *Cornhill Magazine* 1872–82; then became editor of the great *Dictionary of National Biography*, still (1891) in publication. Among his separate publications are: *Hours in a Library* (3 series); *Free Thinking and Plain Speaking*; *English Thought in the 18th C.*; *Science of Ethics*; lives of several

English men of letters; Life of Henry Fawcett. He edited *Fielding's Works* (1882), adding a biographical essay.

STEPHEN, SAINT, THE DEACON: the protomartyr, or earliest of the Christian martyrs; one of the seven deacons named Acts vi., where his martyrdom, about A.D. 37, is recorded. His festival is one of those which accompany that of Christmas—Dec. 26 in the Latin Church. His relics were believed to have been discovered 415, the 'discovery' being commemorated by a festival held Aug. 3.—In the calendar of the Rom. Cath. Church are several other saints of the same name, of whom perhaps the most remarkable is Stephen, king of Hungary in the early part of the 11th c., who died 1038.

STEPHENS, stē'vénz, ALEXANDER HAMILTON, LL.D.: 1812, Feb. 11—1883, Mar. 4; b. Crawfordsville, Ga.: statesman. His father was a Penn. capt. in the revolution, removed to Ga., and left his son an orphan at 15, to be educated by a friend and by charity. Graduating at the Univ. of Ga. 1832 as the first scholar in his class, he began the practice of law two years later. Opposing nullification, and the lawless 'vigilant' proceedings then as now in vogue, he was nevertheless elected to the legislature 1836-40. His first speech there was notable as made for a state railroad (from Atlanta to Chattanooga). He became state senator 1842, and mem. of the U. S. house of representatives 1843, continuing until 1859. His first speech in congress, though he was a state-rights man and afterward opposed secession as inadvisable only, was remarkable as upholding the power of the general government to regulate states in matters pertaining to its own organization—the principle involved in recently stigmatized 'force-bills.' He opposed the Mexican war, but hailed its results. He advocated the compromises of 1850, and the same year was co-author of the 'Georgia Platform,' which held 'the American Union secondary in importance,' etc. In 1852, he refused to support Gen. Scott for the presidency, and united with the democratic party 1855. In 1859 he suggested in his Augusta speech the revival of the slave-trade, and in 1878 made a laudatory speech at the presentation of the *Emancipation Proclamation* picture. He acquiesced in secession after it was voted by his state, was member of the Confederate provisional and subsequent congress, and vice-pres. of the Confederacy, and 1865 chairman of committee in the Hampton Roads peace conference. After the war, he was imprisoned in Fort Warren, Boston, 5 months, and released on parole; elected U. S. senator 1866, under Pres. Johnson's proclamation, not recognized by congress; was in the 43rd-47th congresses; and was gov. of Ga. 1882-3. Of the Jeffersonian school in general, he was a man of striking inconsistencies (some of them more striking than real) in politics; but scholarly, earnest, independent, unfalteringly courageous, and an effective

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speaker, notwithstanding his physical ills and deficiencies. He published a school hist. of the U. S.; and *Constitutional View of the War between the States* (1867-70).

STEPHENS, ANN SOPHIA (WINTERBOTHAM): author: 1813-1886, Aug. 20; b. Derby, Conn. At the age of 18 she married Edward S.; soon removed to Portland, Me.; edited the *Portland Magazine* 1835-37; then removed to New York, where she was editor of the *Ladies' Companion* several years; was on the editorial staff of *Graham's Magazine* and *Peterson's Magazine*; and 1850 travelled in Europe and the East. Soon after her return she became noted as a novelist. Among her works were: *Fashion and Famine* (1854); *The Old Homestead* (1855); *The Rejected Wife* (1863); *The Reigning Belle* (1872); and a *Pictorial History of the War for the Union*. An edition of her works in 23 vols. was published 1886. She died at Newport, R. I.

STEPHENS, *stē'vénz* (Fr. ESTIEN *Æ*): noble Provençal family; distinguished as printers and publishers.

HENRI ESTIENNE (abt. 1470-1520), the founder, settled at Paris 1502; and carried on the business of printer and bookseller for more than 20 years.

ROBERT ESTIENNE (1503-59), second son of Henri, was in possession of the business 1526: he published (1528) his first Latin Bible, in folio. Every year of his life is marked by the issue from his printing-press of several volumes, many of them masterpieces of art, and all surpassing anything of the kind previously seen in France. He was at once printer, publisher, commentator, and author. Though prosperous, he showed that truth—or that which he saw as truth—was to him of more value than worldly gain. Having become a convert to the doctrines of the Reformation, he endeavored for some time to reconcile his convictions with the demeanor required by his position. But his Greek Testament of 1550 (in folio) drew upon him a public prosecution; and though the prosecutions failed legally, they were financially disastrous. Having first sent his family to Geneva, he followed them 1551. Later the S. family found that they had fled from Rom. Cath. persecution to Prot. controversy and censure. Robert, his second son, shortly afterward returned to Paris, where he resumed his father's business, returning to the Rom. Cath. Church.

HENRI ESTIENNE, sometimes called Henry the Second (1528-98; b. Paris; eldest son of Robert), succeeding his father on his death 1559, was repeatedly called before the consistory in Geneva, reprimanded, ordered to print cancels, and excommunicated. Though Henri had the same literary industry and ability as his father, he unfortunately lacked his father's practical turn of mind. Devoted to his art and to his calling, he seems to have been without worldly prudence. In two years he had revised and published more than 4,000 pages of Greek text; at the same time writing his *Apologia pro Herodoto*, a work of formidable length and learning. Ren-

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dered nervous and irritable by an overworked brain, and by pecuniary difficulties gathering fast around him, the petty surveillance and censorship of the pious pastors of Geneva became intolerable. Travelling, originally undertaken from literary curiosity, grew into a necessity of life. In 1578, he visited Paris, where for several years he became a hanger-on of the court of Henry III., who bestowed on him a pension, which the state of the royal exchequer rendered merely nominal. Quitting Paris, he wandered in poverty over Europe, his own family often ignorant of where he was. He died at Lyon. Great as a publisher and commentator, Henri S. was not less great as a scholar; and his reputation as scholar and editor has increased in late years. His *Thesaurus Linguae Græcæ* is his principal monument, and that 'could have been produced by no one but a giant.' His mastery of Greek seems to have been almost complete, and as a critic of the French language he is still esteemed in France.—See Feugère, *Caractères et Portraits* (1864); *Quarterly Review* (1865); article in the *Biographie Générale*; Bernard, *Les Estiennes* (1856); Renouard, *L'Imprimerie des Etiennes*.

STEPHENS, WILLIAM: 1671, Jan. 28—1753, Aug.; b. in the Isle of Wight. He was educated at King's College, Cambridge; studied law, but soon entered political life, and became a member of parliament. About 1730 he visited S. C., and through the influence of Gen. Oglethorpe became sec. of the Ga. colony 1737. He was pres. of the colony 1743–50, resigning on account of failure of his bodily and mental powers. He died in Georgia. He published a *Journal of the Proceedings in Georgia* (3 vols. 1742).

STEPHENSON, *stē'vén-son*, GEORGE: great improver of the locomotive: 1781, June 9—1848, Aug. 12; b. Wylam, eight m. from Newcastle, England. His family were in great poverty, his father having to maintain a family of six children on 12s. per week, earned by tending a colliery-engine. George's first employment was herding cows at 2*d.* per day, from which he was promoted to hoeing turnips at 4*d.*; subsequently, he was appointed fireman at Midmill Colliery, and at the age of 15 we find him rejoicing on his salary being raised to 12s. a week. As fireman, he applied himself to diligent study of the steam-engine, taking his machine to pieces during his leisure hours, and thus gaining a thorough practical knowledge of it. At Black Callerton Colliery, 1801, by dint of mending shoes and cleaning watches, in addition to his regular employment, S. contrived to save his first guinea. At 21 he had saved as much as enabled him to furnish a cottage in a humble way, and 1802, Nov. 28, he married Fanny Henderson: she died 1804, while her husband was brakesman at Killingworth Colliery. Out of his humble gains he paid 4*d.* a week for lessons in reading, writing, and arithmetic, which were conned over at night, and mastered by the light of his

engine-fire. In 1815, his invention of a colliery safety-lamp, the 'Geordie,' brought his name before the public—a long controversy resulting from the fact of his invention being almost simultaneous with that of Sir H. Davy. In 1819, he married his second wife, Elizabeth Hindmarsh, daughter of a farmer at Black Callerton.

At Killingworth Colliery S. constructed his first locomotive, whose lack of efficiency he soon remedied with various improvements, notably the 'steam-blast.' In 1821, S. was appointed engineer for construction of the Stockton and Darlington railway; the line, on its completion, being partially worked by means of his great invention. About the same time he was chosen engineer of a projected railway between Liverpool and Manchester. That he proposed to work the line with an engine moving at the rate of 12 m. an hour was considered sufficient to stamp the project as a bubble. 'Twelve miles an hour!' exclaimed the *Quarterly Review*—'as well trust one's self to be fired off on a Congreve rocket.'

When the bill ultimately passed, 1826, S. was appointed principal engineer, with salary £1,000 a year. After immense difficulties, the line was completed 1829. Then ensued the memorable competition of engines, resulting in the triumph of S.'s 'Rocket' (see the quotation above), which, to the astonishment of every one except himself, was found capable of travelling at the then amazing rate of 35 m. an hour. While occupied in carrying out the vast system of railway which soon overspread the country, S.'s home was at Alton Grange, near Leicester. He saw little of it, however, as he was often travelling on business for weeks at a time. During the three years ending 1837, he was principal engineer on the N. Midland, York and N. Midland, Manchester and Leeds, Birmingham and Derby, and Sheffield and Rotherham railways. He has been known to dictate reports and letters continuously for 12 hours. But his heart remained youthful: in spring, he would snatch a day for bird-nesting or gardening: in autumn, nutting was still a favorite recreation. During the railway mania, his offices in London were crowded every day with men of every rank and condition, eager to strengthen their prospectuses by the weight of his name. Where he disapproved—and at this time he almost always did disapprove—he invariably declined, though by acceding he might have made enormous gain. In the autumn of 1845, he visited Belgium and Spain for professional purposes, and on his way home was seized with pleurisy, from which he seems never to have thoroughly recovered. He occupied his declining years with the quiet pursuits of a country gentleman; and died at his country-seat of Tapton. The leading features of his mind were honesty and indomitable purpose: 'I have fought for the locomotive single-handed for nearly twenty years,' he says; 'I put up with every

rebuff, determined not to be put down.' Toward trickery and affectation he never concealed his contempt, while honest merit never appealed to his liberality in vain.—See *Lives of Engineers*, by Samuel Smiles, III. (Lond. 1862).

STEPHENSON, ROBERT, D.C.L. : engineer : 1803, Oct. 16—1859, Oct. 12 ; only son of George S. He attended a school in Newcastle. In 1820, his father was able to send him to the Univ. of Edinburgh. In 1823, he assisted his father in the survey for the Stockton and Darlington railway, and subsequently in the locomotive engine-works at Newcastle—taking the management about 1827. During the discussion as to the power on the projected Liverpool and Manchester line (see STEPHENSON, GEORGE), he was in constant communication with his father, to whom his quick perception and judgment were of great assistance. Soon afterward he was appointed engineer of the Leicester and Swanington railway ; and then joint managing engineer with his father of the London and Birmingham line. In 1829, he married Frances, daughter of John Sanderson, merchant in London : she died 1842 without issue ; and he did not marry again. His work on the London and Birmingham line raised S. to the very highest rank in his profession : business flowed in on him ; in one parliamentary session he was engaged in 33 new schemes. Projectors thought themselves fortunate if they could procure his services on any terms.

The Britannia Tubular Bridge, completed 1850, of which S. was the master spirit, is one of the great engineering achievements of the century (see BRIDGE : TUBULAR BRIDGE).

Of the same class were his Victoria tubular bridge across the St. Lawrence at Montreal, and the two bridges across the Nile at Damietta. In 1847 he was returned to the house of commons for Whitby. In 1850 he completed the great viaduct across the Tweed at Berwick. In 1855 the emperor of the French decorated him with the Legion of Honor, the Univ. of Oxford made him D.C.L., and he was elected pres. of the Institute of Civil Engineers.—In Norway, 1859, he was seized by the illness which ended his illustrious career. He was buried in Westminster Abbey.—It was as a workman that S. was great, his political views being at times rather narrow. Contrasting him with his great rival Brunel, it has been said that Brunel's ambition was to make a great work, S.'s to make a work which would *pay*. Robert S. inherited the kindly spirit and benevolent disposition of his father ; and to him he was ever ready to attribute the chief merit of his own achievements.—See *Lives of the Engineers*, by S. Smiles, III. (Lond. 1862).

STEPNIAK—STEPPE.

STEPNIAK, *stěp'nĭ-ăk*: *nom de guerre* of **SERGIUS MICHAEL DRAGOMANOFF**: Russian nihilist leader and writer: b. 1841 at Hadjatsh, in the Ukraine Mts. He was educated at Kieff Univ., meanwhile publishing several works which were suppressed by govt. He was tutor in history at Kieff 1865, and professor 1870, but was dismissed from his post 1873; three years later he was exiled on account of his criticisms of the system pursued by Count Tolstoi in administering the dept. of public instruction. S. settled at Geneva, and continued the revolutionary propaganda, publishing numerous popular tractates in the dialect of Little Russia. Later he took up his residence in London, where he contrives to maintain a secret regular correspondence with the disaffected elements in his native land. He labors through frequent contributions to magazines, newspapers, etc., in Europe and America, and by public discourses, to diffuse information concerning the social and political conditions of the Russian people. Among his principal published works are: *The Turks Within and Without*; *Tyrannicide in Russia*; *Little Russian Internationalism*; *Historical Poland and the Muscovite Democracy*. He has written much also on the ethnography, history, and literature of Little Russia. He d. 1895, Dec. 23.

STEPPE, n. *stěp*, plu **STEPPES**, *stěps* [Ger. *steppe*, a heath, a desert: Russ. *stepe*, a steppe]: one of the vast flats or plains of Russia, corresponding to the prairies, savannahs, and pampas of America. The steppes, vast, treeless and semi-barren, with occasional low ranges of hills, stretch from the Dnieper across s.e. European Russia, round the shores of the Caspian and Aral seas, between the Altai and Ural chains, and occupy the low lands of Siberia. In spring and early summer, the steppes have a thin covering of herbage, become parched and barren under the scorching heat and drought of June, and in winter are hid beneath deep snow, which, raised in huge white thin clouds, and driven hither and thither by furious storms, brings destruction to every living creature within its sweep. The monotony of the S. is as fatiguing to the traveller as that of the sandy, arid desert: for hundreds of leagues there stretches to the horizon the same unvarying level of scanty herbage, unbroken by tree or bush; only in spring, while the vegetation is succulent and fitted for pasture, is the solitude broken here and there by herds of horses and cattle, and their mounted guardians. In autumn, when the tall herbage, withered by summer heats, has been rooted up and broken by violent winds, it becomes gathered and rolled together into enormous balls, sometimes 30 ft. in diameter. A few tracts offer some inducement to the agriculturist; such are the steppe e. of the Dnieper, that between the Don and Volga—rich in coal—and the steppes of s.w. Siberia, especially those in the govt. of Tomsk, all of which have been partially colonized; but the great extent is hopelessly barren.

-STER—STERCULIACEÆ.

-STER, suf. *stér*: termination denoting occupation, e.g., in maltster, gamester, huckster, etc. Till the end of the 13th c. the suffix *-ster* denoted the feminine gender, and by its means new feminines could always be formed from the masculine. In the 14th c. the suffix *-ster* began to give place to the Norman-French *-ess*, and there is consequently lack of uniformity in its use. In modern English there is only one feminine with this suffix, spinster, though huckster was used very late as a feminine, and sewster is still used in Scotland and in provincial dialects. When the original feminine force of the suffix *-ster* was forgotten or lost, some new feminines were formed from English feminines by the addition of the French suffix *-ess*, e.g., seamster, seamstress, songster, songstress, which are really double feminines.

STER-: see STEREO-.

STERCORACEOUS, a. *stér'kō-rā'shūs* [L. *stercus*, dung, *stercōris*, of dung]: pertaining to dung; resembling dung. STER'CORA'RIUM, n. *-rĭ-ŭm* [mid. L.]: a privy; a dunghill. STER'CORA'RIAN, n. *-ăn*, or STER'CORANIST, n. *-răn-ĭst*, in the *Chh. of Rome*, one who held that the Host is liable to digestion and all its consequences like other food. STER'CORA'RIANISM, n. *-rā'rĭ-ăn-ĭzm*, the doctrine that the Host is digested like other food, contemptuously applied.

STERCULIACEÆ, *stér-kū-lĭ-ă'sē-ē*: natural order of exogenous plants, closely allied to *Malvaceæ* and *Byttneriaceæ*, and consisting of large trees and shrubs, natives of warm climates. About 130 species are known. The flowers of some are irregular; and in some they are hermaphrodite, in others unisexual. Here belongs the *Theobroma* or Chocolate Tree. The *Mahernia Verticillata*, from the Cape of Good Hope, is a favorite house-plant, a slender woody plant, with sweet-scented, honey-yellow flowers, produced all winter and spring. Many species, particularly of sub-order *Bombaceæ*, are trees of gigantic size, among which is the Baobab or *Adansonia* (q.v.) *digitata*. The bark of some species is very fibrous, so that it is made into ropes and coarse cloth. The light wood of *Ochroma lagopus* is used in the W. Indies instead of cork. *Sterculia fetida*, Indian tree, with excessively fetid flowers, has pale wood, very durable, and susceptible of high polish: spars of this wood are called *Poon Spars*. The seeds of some species, as of the Silk-cotton (q.v.) trees, are surrounded with silky hairs. The seeds of all the species are oleaginous; those of some are eatable, e.g. the CHICHA (*Sterculia chicha* and *S. lasiantha*) of Brazil, which are about the size of a pigeon's egg, and have pleasant flavor: they are roasted before being eaten. The Cola Nut (q.v.) of Africa is the seed of a *Sterculia*. The whole order agrees with *Malvaceæ* in possessing mucilaginous and demulcent properties. The Gum Tragacanth (q.v.) of Senegal and Sierra Leone is produced by a *Sterculia*. The Durian (q.v.) is the fruit of a tree of this order.

STERE—STEREOPTICON.

STERE, n. *stēr* or *stär* [F. *stère*—from Gr. *sterěōs*, firm, solid]: in *France*, the unit for solid measure, a cubic *mètre*, and equivalent to 35·3165818168 cubic ft. or 1·3080215487 cubic yards (see **METRE**). The *decastère* is equal to 10 steres, and the *decistère* to the tenth part of a stere. This measure is much used for firewood.

STERELMINTHA, *stēr-ěl-mǐn'tha* [Gr. *stereos*, solid, and *helmins*, an intestinal worm] term suggested by Prof. Owen, generally adopted to signify those intestinal worms which have no true abdominal cavity, and which were called 'parenchymatous' by Cuvier: see **CÆLELMINTHA**.

STEREO-, prefix, *stēr-ě-o* or *stēr-ě-o* [Gr. *stereos*, solid]: solid; having an appearance of solidity.

STEREO, n. *stēr'ě-ō*: a common contraction for **STEREO-TYPE**, which see. **STEREOS**, n. plu. *stēr'ě-ōz*.

STEREOCHROME, n. *stēr'ě-ō-krōm*, or **STER'ECHRO'MY**, n. *-kró'mǐ* [Gr. *sterěōs*, solid; *chrōma*, color]. imitation of fresco-painting, or substitute for it, in which the colors are indelibly fixed by a varnish of a soluble glass: see **GLASS—Soluble**: **FRESCO**.

STEREOGRAPHY, n. *stēr'ě-ōg'rǎ-fǐ* [Gr. *sterěōs*, solid; *graphō*, I write]: the act or art of delineating the forms of solid bodies on a plane. **STER'EOGRAPH'IC**, a. *-ō-grǎf'ík*, or **STER'EOGRAPH'ICAL**, a. *-ǎ-kǎl*, done according to the rules of stereography; delineated on a plane. **STER'EOGRAPH'ICALLY**, ad. *-lǐ*.

STEREOLEPIS, *stēr-ě-ōl'ě-pǐs*: genus of fish, represented on the Pacific coast by *S. gigas*, there confusingly called Jew-fish, and sometimes Black Sea bass. It attains 500 lbs. weight, ranges from the Farallone Islands to San Diego, and when small enough to be available brings a high market price.

STEREOMETER, n. *stēr'ě-ōm'ě-tēr* [Gr. *sterěōs*, solid; *metron*, a measure]: an instr. for measuring the specific gravities of various substances, solid as well as liquid. **STER'EOM'ETRY**, n. *-ě-trǐ*, the art of measuring solid bodies; the art or process of finding the specific gravity of certain substances. **STER'EOMET'RICAL**, a. *-ō-mèt'rǐ-kǎl*, pertaining to or performed by stereometry. **STER'EOMETRICALLY**, ad. *-kǎl-lǐ*.

STEREOPTICON, n. *stēr'ě-ōp'tǐ-kōn* [Gr. *stereos*, solid, firm, *optikos*, of sight]: double magic lantern, of which the two objective tubes can be focussed on the same part of a screen. It is used to bring one image after another on the screen by the alternate use of the lanterns. See **DISSOLVING VIEWS**.

STEREOSCOPE.

STEREOSCOPE, n. *stěr'ě-ō-skōp* [Gr. *sterēōs*, solid, *skopēō*, I view]: optical instr. through which two objects or views that have been photographed at a certain angle appear as one, and standing out in a solid form as in nature. **STEREOSCOPIC**, a. *-skōp'ik*, pert. to the stereoscope, or adapted to it. **STEREOSCOPIST**, n. *-ōs'kō-pīst*, one skilled in the use or construction of the stereoscope. **STEREOSCOPY**, n. *-pī*, the art or science of using the stereoscope or of constructing it.—The *Stereoscope* is an invention by means of which pictures of objects possessing three dimensions, are seen not as plane representations, but with an appearance of solidity or relief, as in ordinary vision of the objects themselves. For the more recondite principles of the S., which are of interest and importance in their bearing on the philosophy of Perception (q.v.), see **VISION**, **BINOCULAR**. The present article deals with its history, and with the optical and mechanical details of its construction.

The essential principle of the S., whose first conception by Prof. Wheatstone ranks as a brilliant optical discovery, may thus be explained. It is obvious that the eyes being separated by a certain interval of space, all solid objects so near to the observer as to be seen with a sensible convergence of the optic axes, necessarily form retinal pictures, differing as to their perspective projections for each eye. The true import of this fact was unsuspected prior to the investigations of Prof. Wheatstone, who, in his first paper on this subject, in *Philosophical Transactions* 1838, established the conclusion that this dissimilarity of the retinal images has an important use in our visual organs—that it is, in fact, the principal origin of our immediate perception of the solidity (or relief) of objects adjacent to the sight. To test by experiment the question: ‘What would be the visual effect of simultaneously presenting to each eye, instead of the object itself, its projection on a plane surface as it appears to that eye?’ he devised the S., which as improved by him is shown in fig. 1.

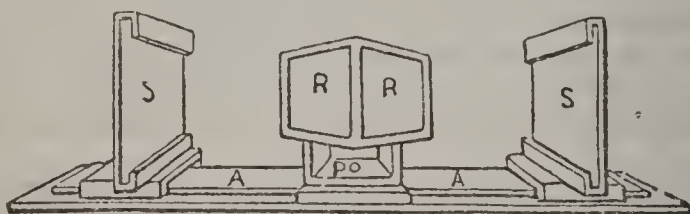


Fig. 1:

R, R, two square mirrors about three inches in diameter, fixed vertically with their backs at a right angle with each other; S, S, slides for the reception of the pictures, the *left-hand* picture being placed in the *right-hand* slide, and *vice versa*, on account of the lateral inversion of their reflected images. S, S are made to slide along the arms A, A, so that their distance from R, R. may be varied at pleasure. S, S also revolve each on a vertical axis, to admit of the variation of their angular position with reference to the arms A, A. A, A may also be moved in a horizontal plane, on the common pivot, P.

The pictures being attached to the slides, the observer places himself with his nose close to, and immediately in front of, the vertical angle made by the reflectors, so that

STEREOSCOPE.

the view by each eye is limited to the rays reflected by its appropriate mirror; the pictures are then seen, as it were, behind the mirrors, and the eyes being made slightly to converge, either by an effort of the will, or by drawing the slides. S, S, a little forward, the effect of either of which is to refer the reflected images to the same part of space, the observer sees no longer mere pictorial resemblances, but, to all appearance, the objects themselves, exquisitely modelled, occupying a certain extent of space, and with an aspect strikingly substantial.

The ultimate philosophy of the illusions of stereoscopy is that there is mental construction of the images as solid, from the force of habit, just as, with the eyes shut, the mind constructs forms through the sense of touch. With the two pictures exchanged in place—the right put in place of the left and *vice versa*—a convex surface will appear concave, for example, simply because we are accustomed to associate concavity with the point of view presented by the combined image.

At the outset, the only stereoscopic pictures obtainable were the outlines of geometrical solid figures, depicted with perspective projections adapted for the right and left eye respectively; these excited great admiration. The modifications of crystals have been well represented by this means. In 1849, Sir David Brewster originated the form of S. now in general use. For this—the lenticular S.—the pictures from two different points of view are mounted side by side, on a piece of cardboard, and, being placed in the instrument, are viewed through semi-lenses, fixed at the distance apart of the two eyes. To effect the displacement of the pictures, essential for their being referred to the same part of space, Sir David Brewster availed himself of an optical principle, by which also he fulfilled several collateral ends. This principle may be described as follows: If an object be viewed through the centre, or, more properly, along the axis, of a convex lens, it will be seen exactly in front of the eye; i.e., in a line with the eye, the centre of the lens, and the actual place of the object. If now the lens be moved slightly to the left, the object will appear to advance toward the right; and, conversely, as the lens is moved toward the right, the object is displaced in the opposite direction. Let the lens be cut in half, transversely, and the two semi-circular pieces reversed as to their former position, i.e., placed side by side, and so that their thin edges shall be adjacent while the two plane edges, formed by the section of the lens, are kept in mutual parallelism, and have their faces turned outward, toward the left and right respectively: the right eye will now look through the left half of the lens, and *vice versa*; and the two pictures, each placed opposite its appropriate eye, and in the principal focus of the eye-piece will be seen, not in their actual places, but in a position midway between the two. The subsidiary purposes served by this arrangement are, that the pictures are magnified as well as caused to coalesce; and that the equality of the magnifying power of the eye-pieces (a result by no other means certainly attainable)

STEREOSCOPE.

is secured by the fact of their being cut from the same lens, the whole of which is thus advantageously and economically utilized. In many imperfect instruments the conditions stated above are inadequately fulfilled; the parallelism of the two sectional planes of the semi-lenses, and their rectangularity with two imaginary planes joining their opposite ends respectively, are not maintained; as a consequence, the coalescence of the pictures is effected, if at all, by a forced and more or less painful displacement of the eye.

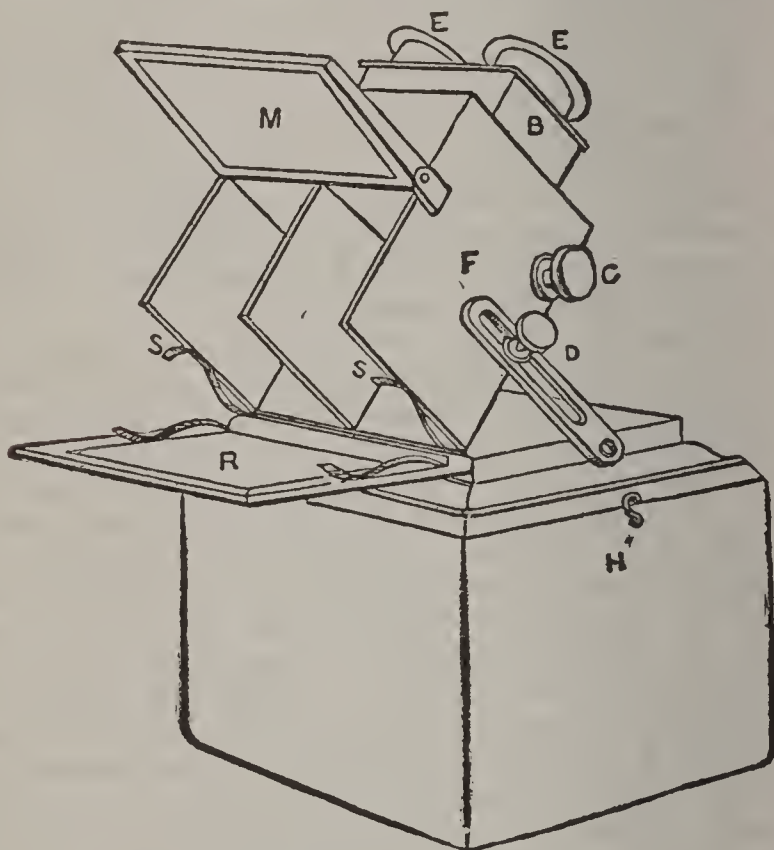


Fig. 2:

E, E, the eye-pieces fitted to the sliding-box, B, which, by means of the milled head, C, attached to a rack-and-pinion movement, can be moved out or in for adjusting the focus. D, a slot and screw for fixing the body of the stereoscope, F, at any desired inclination; M, a mirror for reflecting light upon the picture, which is inserted between the springs, S, S, and the woodwork of the stereoscope, and is thus firmly held. For viewing transparencies, the flap containing M is closed, and the picture illuminated by light reflected through it by the mirror, R, the inclination of which is adjustable at pleasure; H is a box forming a convenient receptacle for the whole of the instrument.

balls. This parallelism of the sides of the semi-lenses may be either actual or virtual; for to whatever shape they may be cut (the circular is usual), the foregoing conditions are not altered. An achromatic S. is shown in fig. 2.

It remains to speak of the pictures in their relation one to the other as a stereoscopic pair. To reproduce exactly the conditions of normal vision, they should be taken from points of view separated laterally by a space equal to the distance between the eyes, about $2\frac{1}{2}$ inches; and for objects within narrow limits this rule is observed. But for wider range, e.g., an extensive architectural pile. photographers

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take their pictures usually from spots separated by a considerable interval; and the stereoscopic slides thus obtained give very striking effects of solidity or relief. Inasmuch, however, as these effects are due to a gross exaggeration of the ordinary difference of perspective relatively to the two eyes, they to a like extent misrepresent the actual scene; and on the whole it is better to conform to the conditions of natural binocular vision. The pictures should be mounted in exactly the same line. As the apparent solidity of the objects viewed in the S. conflicts with the evident flatness of the cardboard mount, it is advantageous to adopt the following expedient. The pictures must be of the same size, but instead of having them identically the same as regards the objects represented on each, let the left-hand picture include on its left-hand margin somewhat less than is found on the same margin of the right-hand picture; similarly, let its right-hand margin contain somewhat more than is found on the same margin of the right-hand picture; then will the view appear to extend well out of and beyond the cardboard, which forms, as it were, a framework around it. This ingenious arrangement does but reproduce the conditions which obtain whenever we look out on a scene through a casement a few feet away. Warren De La Rue availing himself of the libration of the moon, has obtained lunar stereoscopic photographs, which exhibit the moon with a general rotundity, while the objects on its surface are seen in conspicuous relief. These effects are due to an exaggeration of the 'binocular parallax;' for by no human eyes, how near soever they might be placed to the lunar surface, could such a view be obtained: it is, as Sir John Herschel has remarked, as though the moon were seen with the eyes of a giant, placed thousands of miles apart.

Among minor applications of the S. are the STEREO-MONOSCOPE and the STEREO-TROPE. In the stereomonscope, the two pictures of a stereoscopic pair are projected, by lenses, on to the posterior surface of a piece of ground glass, one upon the other, or so that they occupy the same place; when the observer, looking from the opposite side of the glass, sees them not as a confused mixture of two pictures, but as a single stereoscopic representation, possessing the usual attributes of solidity or relief. The stercotrope consists in an application of the principle of the S. to that class of instruments variously termed thaumatropes, phenakistoscopes, etc., which depend for their results on 'persistence of vision.' In these instruments an object represented on a revolving disk in the successive positions that it assumes in performing a given evolution, is seen to execute the movement so delineated; in the stercotrope, the effect of solidity is superadded, so that the object is seen as if in motion, and with an appearance of relief as in nature: see ZOETROPE. Swann made an ingenious application of stereoscopy to portraiture; Hardie proposed a reflecting stereoscope, in which the planes of reflection are vertical. The stereoscope has been found of value in examining forged bank-notes or printed papers. See Brewster, *The S.*

STEREOTOMY—STEREOTYPE.

(1856); Helmholtz, *Physiol. Optik*, and his *Popular Lectures on Scientific Subjects* (transl. 1874).

The most important application of the stereoscopic principle is in the binocular microscope. In this, the right and left eye pictures, respectively, are thus obtained: immediately behind the object-glass, a small peculiarly shaped prism is placed in such position that it shall receive all the rays coming through the right half of the lens. These rays, after being twice reflected within the body of the prism, finally emerge at such an angle to their original direction that they cross the undiverted pencil of rays transmitted by the other half of the lens, and are then received into a second tube, which, being inclined to the first or main tube at an appropriate angle, conveys them to the left eye; while the other complement of rays pursues an undeviating course to the right eye. Each of the two tubes is fitted with the usual eye-pieces; and object-glasses of all but the highest powers may be used with pleasure and advantage. For a fuller explanation, see the original paper by Wenham in *Transactions of the Microscopic Society* (England), new series, IX. 15.

STEREOTOMY, n. *stěr'ě-ōt'ō-mĭ* [Gr. *sterēōs*, solid; *tomē*, a cutting]: the art of cutting solids into certain figures or sections. **STER'EOTOM'IC**, a. *-tōm'ĭk*, pertaining to.

STEREOTYPE, n. *stěr'ě-ō-tĭp* [Gr. *sterēōs*, solid; *tupos*, type, form]: a metal plate cast from a mold taken from one or more pages of movable types, for subsequent use in printing from: **V.** to cast metal plates from movable types: **ADJ.** printed from plates, as *stereotype* edition. **STER'EOTYPING**, imp.: **N.** the act or art of taking casts from movable types. **STER'EOTYPED**, pp. *-tĭpt*: **ADJ.** fixed: unchangeable, as opinions. **STER'EOTYPER**, n. *-ēr*, one who casts stereotype plates. **STER'EOTYP'IC**, a. *-tĭp'ĭk*, pertaining to. **STER'EOTYPOG'RAPHY**, n. *-tĭ-pōg'ră-fĭ* [Gr. *graphō*, I write]: the art or business of stereotype printing. **STER'EOTYPOG'RAPHER**, n. *-ră-fēr*, a stereotype printer.

STEREOTYPING.

STER'EOTYPING: art of fabricating metal plates resembling pages of type, from which impressions may be taken as in ordinary letterpress printing (see **TYPOGRAPHY**). The plates, of type-metal, are about three-sixteenths of an inch thick, perfectly smooth on the back, and having a face exactly resembling a page of movable type. To yield an impression, the plates are fastened by a temporary arrangement to blocks of wood—plate and block together having the height of a type, or one inch. S. is not employed where only a definite and moderate number of impressions of any work are required. Its chief value is in its availableness for future impressions contingent on renewed demand; but it is important also in duplicating the means of taking large impressions quickly. The discovery of S. has been ascribed to Van der Mey, Dutch printer, who early in the 18th c. executed editions of the Bible from forms of fixed type: his process, however, was not S. in the proper sense; for it was merely soldering together all the types in a page to fix them permanently. The true inventor doubtless was William Ged (d. 1749), goldsmith in Edinburgh, about 1725. By him in association with others, Bibles and Prayer-books were stereotyped for the Univ. of Cambridge about 1731. Ged's prospects were blighted by the malice of the pressmen employed to print from his plates, which they damaged and rendered imperfect, so that their use was abandoned, and they were sent to be melted. - Ged, in disappointment, returned to Edinburgh, where he executed several editions of Sallust, probably the first book correctly printed from stereotype plates. Copies still exist.

The art has undergone little change since its discovery. In the well-known *stucco* process, the page of type being set, corrected, cleaned, and fixed in a frame, is laid on a smooth iron table, face upward; a little fine oil is brushed over it, to prevent the liquid stucco from adhering; the stucco to the consistency of cream is poured over the face of the page, and straightened over it in the process of hardening; when hardened, the cake of stucco is lifted off, and is seen to be a perfect mold of the types. The cake is baked in an oven, then placed in an iron pan; the pan, which has inlets at the upper side, is plunged into molten metal, which soon runs into the mold; being lifted out and cooled, the pan is opened and found to contain a plate resembling the page of type; the mold is of no further use. When removed from the pan, the plate is rough, and needs to be trimmed for the press. Should any particular letter be defective, it is dug out, and a corresponding type inserted; the end of which type is cut off at the back of the plate by a soldering bolt. In preparing plates for press, nothing is more important than giving a high degree of level smoothness to the back by planing and smoothing. After the S. is finished, the types are distributed. In the process the types deteriorate—their finer parts being rounded off. In some printing-offices, all work is executed from plates, and types are used only to produce molds. Impressions from stereotype plates are seldom so

STEREOTYPING.

sharp and fine as from pages of movable letter; yet S. answers every required purpose in a large variety of cases. Plates properly manufactured, stored, and mended when necessary, will last for repeated impressions to the extent of hundreds of thousands over a long series of years. The stock of plates in some establishments is accordingly large, and represents a considerable capital. When no longer required, the plates are melted down as material for fresh castings.

The *paper* process of S., invented on the continent of Europe, is used in some form by most of the great daily journals. Its general method is the following. A uniform sheet of soft and damp matter is formed by gumming together, first, a sheet of thin yet very tough tissue paper; second, a sheet of loose and bibulous white paper; third, a sheet of fine-grained and tough brown paper. The smooth and white side of the sheet, still soft and moist, is placed on the types: both are then put in a press. A roller passes under the form, and presses it up against the paper, so as to take the impression of the types and convert it into a mold. The dents made by the types rise on the outside of the paper, so that any spot where the paper has not sunk into the spaces between the types is at once detected: such spots generally occur, and are removed by the paper being driven in between the types by blows of a hard brush. The dents made by the types are represented by elevations on the outside of the sheet, while the interstices are represented by corresponding hollows. The latter are filled up at this stage by a thin coating of stucco laid on by a brush. The mold is then carefully removed, dried, and placed in a shallow box of metal placed upright. The smooth or stucco side of the mold is pushed against the back of the box: the lid is then closed very tightly, leaving only an opening at the top. Through this opening molten metal is poured, and a plate is thus formed, one side of which is a cast from the mold. It contains elevations at places where there are wide spaces between the types, and these it is necessary to remove with the chisel: in other respects the plate is an exact copy of the form. The great advantage of this mode is its rapidity. Plates from stucco could scarcely be produced and ready for press in less than six hours; plates from paper can be produced and laid on the machine in seven minutes. The forms of types themselves are no longer used; a number of plates being produced corresponding to the number of machines employed, all the copies of the paper are printed from them, effecting a very great saving in cost of types. It was necessary to renew the font every few months in some offices when papers were printed directly from types. Now the types last as many years as they did months when printed from. To accommodate printing machines on which the forms need to be fixed in a cylinder, the paper molds are placed in pans or boxes of the required shape. The molds are then bent with their backs outward, and the molten metal is poured between the concave mold and convex lid. The plates are cast generally in

STERIGMATA—STERLING.

four segments, which screwed together form a cylinder. They are adjusted to the printing press by a planing machine, which cuts their inner surface to the exact convexity of the cylinder. To this duplication there is no limit; sets of plates can be produced to any required number. As copies of old newspapers are not wanted, the plates are melted down as soon as the operations of the day are over. Even when books are printed from movable types, it may serve a good purpose to take paper molds from them before distribution; for the molds, on being dried, can be laid aside, and be afterward employed for fabricating plates should a new impression be wanted. The author of a book could at insignificant addition to the expense of typography, possess himself of a set of paper molds of his work, to be used at some future period, thus saving the composition for a new edition.

A modification of the S. process which has obtained considerable application is known as the chalk-plate process, for producing engravings. A plate of steel is covered with a chalk-like composition, for which numerous formulæ have been given. In general, a mixture of ground talc or its equivalent with some cementing material may be used: silicate-of-sodium solution, or flour-paste may be the cement; with this the plates are coated to a thickness of about one-sixteenth of an inch. The surface of the plate may first be slightly roughened and flowed over with albumen to secure adherence. The artist sketches his design on the chalk-plate, when dry, with a steel stylus, cutting clear through to the metal always. This is used as a matrix, and on it type-metal is cast to give a relief-plate.

Electrotyping is now extensively used instead of S.: it gives a more durable and finer plate.—See **TYPOGRAPHY**.

STERIGMATA, n. plu. *stěr-ĩg'mă-tă* [Gr. *stērigma*, a prop or support]: in *bot.*, cells bearing naked spores; cellular filaments to which spores or spermatia are attached, as in the spermagones of lichens.

STERILE, a. *stěr'ıl* [F. *stérile*—from L. *sterilis*, barren: It. *sterile*]: barren; unfruitful; unproductive; barren of ideas. **STERILITY**, n. *stěr-ıl'ĩ-tĩ*, barrenness; unfruitfulness; state of not producing young, as animals.

STERILIZE, vt. *stěr'ıl-iz*: to deprive of productive or reproductive power; render barren; cause to be fruitless: sometimes used figuratively; as, to *sterilize* the soul;—also, to destroy bacteria or other micro-organisms in; as, to *sterilize* an infusion by boiling (see **BACTERIA**). **STERILIZATION**, n. *stěr-ıl-ĩ-ză'shũn*: act or process of destroying germs in milk by heating to just below the boiling-point. *Pasteurization* is the act or process of destroying germs by heating considerably below the boiling-point.

STER'LET: see **STURGEON**.

STERLING, a. *stěr'lıng* [originally the name of the English penny, the standard coin; subsequently applied to the coinage of England in general—from the *Esterlings* or North Germans, who first made money in England]: of standard value; genuine; sound; pure; of excellent quality.

STERLING—STERNBERG.

S. is an epithet generally applied to the money of the United Kingdom. The original standard of money was weight, and among the Anglo-Saxon and Teutonic nations the basis of weight was in early times supplied by the wheat-corn. Charlemagne superseded the earlier systems by a new coinage, in which a pound of 12 ounces became the money-weight, each pound being divided into 20 solidi, and each solidus into 12 denarii of the weight of 32 wheat-corns. The older *silver* or scruple of 24 wheat-corns being superseded by the penny of 32 wheat-corns, the term S. seems to have been applied to the latter, in consequence of its being in use among the Ripuarian or Austrasian Franks, sometimes called the *Easterlings*, while the old scruple continued to be used by the Northmen. In England, where the change was early introduced, the word came to indicate the fineness or standard of the silver; and nearly the same standard, consisting of 11 oz. 2 dwt. of pure silver, and 18 dwt. of alloy to the pound troy, or $\frac{18}{22}$ dwt., seems to have subsisted from the 12th c. onward. The superiority of the Eng. standard silver as currency has been generally acknowledged in Europe; hence the adjective S. has become a synonym for pure, genuine, and solid.

STERLING, *stér'ling*: city in Whiteside co., Ill.; on Rock river, and on the Chicago and Northwestern and the Chicago Burlington and Quincy railroads; 52 m. e.n.e. of Rock Island, 110 m. w. of Chicago. It derives excellent water power from the river; has various manufactories, banks, public library, and 2 daily and 2 semi-weekly newspapers. Pop. (1890) 5,822; (1900) 6,309.

STERN, a. *stérn* [Dut. *stuursch*, stern: Icel. *stúra*, sorrow: Norw. *sturen*, sorrowful, cast down: comp. Ger. *starr*, rigid, stiff]: severe in countenance, in manners, or in feelings; harsh; unrelenting; steadfast, as *stern* virtue; in *OE.*, hard; afflictive. STERN'LY, ad. -*lŷ*. STERN'NESS, n. -*nēs*, the quality or state of being stern; rigor; severity.—SYN. of 'stern': severe; austere; rigid; rigorous; cruel; unrelenting; immovable.

STERN, n. *stérn* [Icel. *styra*, to steer; *stiörn*, steerage: Dut. *stuur*, rudder (see STEER 1)]: the after-part of a ship; *familiarly*, the hinder-part of anything; in *OE.*, the post of management; direction. STERN-BOARD, the backward motion of a vessel. STERN-CHASER, a cannon in the stern. STERN-FAST, a rope to hold the stern of a ship. STERN-PORT, a port or opening in the stern. STERN-POST, a straight piece of timber which terminates the ship behind and supports the rudder. STERN-SHEETS, the part of a boat between the stern and the rowers where the passengers sit. STERN-WAY, the movement of a ship backward. BY THE STERN, deeply laden at the stern. STERN'MOST, a. furthest astern.

STERNBERG, *stérn'běrch*: town of Austria, in Moravia, 9 m. n.n.e. of Olmütz. It is the chief seat of the Moravian cotton manufactures. Pop. (1890) 15,395.

STERNE, *stérn*, LAURENCE: 1713. Nov. 24—1768, Mar. 18; b. Clonmel, Ireland; son of an Eng. officer, and great-grandson of an abp. of York. Much of his boyhood was passed in Ireland, in abodes that shifted with his father's regt., with possibly some effect in developing the comical and reckless oddity and whimsical exuberance long afterward shown in his character and writings. When about ten years old the boy was consigned to the care of a kinsman in Yorkshire, was by him put to school near Halifax, and thence was transferred 1733 to Jesus College, Cambridge, where 1736 and 40 respectively he took the degrees B.A. and M.A. He was educated for the Anglican priesthood, and on his leaving the univ., his uncle, the Rev. Jaques S., an ecclesiastical dignitary, procured for him the living of Sutton in Yorkshire. With this relative he afterward quarrelled, but not before another appointment had been secured him as prebendary of York Cathedral. In 1741 he was married to a lady whom he met in York; and soon, through the influence of a friend of his wife, he was presented to the additional living of Stillington. Nearly 20 years he lived at Sutton unheard of. That his devotion to his clerical duties was great is more than can be supposed from what we know of his character; and we can readily believe that his choice recreations were, as he says, 'books, painting, fiddling, and shooting.' Till 1759, in which the first two vols. of his *Tristram Shandy* appeared, he had published only two sermons, which, according to his own statement, 'found neither purchasers nor readers.' *Tristram Shandy*, which, though published without his name, was from the first known to be his, had instant and immense success; and S., on going up to London, found himself the literary lion of the day. In 1761 two more vols. of it appeared, followed by vols. V., VI. in 1762, vols. VII., VIII. in 1765, and in 1767 by IX., the last. During this period he issued 4 vols. of sermons 'by Yorick;' and the *Sentimental Journey*, 1768, completes the list of his works.

From the time of his becoming famous his parishioners saw S. but little. He lived mostly either on the continent or in London, where his literary celebrity made him welcome in the best circles. Always an easy, mercurial kind of mortal, he now led a gay life, modelled on the Epicurean maxim of enjoying the present hour, rather than on those more serious precepts that he had been wont to enforce from the pulpit. But except that he does not seem to have been excessively devoted to his own wife—she and her daughter being in these pleasant years but little with him—and was a little of a sentimental Lothario in relation to the wives of other people, no very great harm is known of him. He is said, despite the exquisite sentiment which abounds in his writings, to have been really heartless and unfeeling; and the sneer of Walpole that he could snivel over a dead ass to the neglect of his live mother, is familiar; though indeed the implied slander has no distinct evidence.

Whatever question may be made of the worth of S. as a

man, there can be none of his genius as a writer. *Tristram Shandy*, his chief work, must live as long as the language, were it only in virtue of the three characters, Old Shandy, Uncle Toby, and Trim, among the most perfect and exquisite in the whole range of British fiction. These are genuine creations, at once fantastic and real, in which the subtlest reconciliation is effected between the sportive exuberance of fancy and the sober outlines of truth. Otherwise there is in the work much which needs excuse; in particular, a wilful and gratuitous indecency almost without parallel; and a constant trick of lawless and whimsical digression, to whose endless and incalculable frivolities even the inimitable grace, ease, and tricksy flexibility of the style can hardly reconcile the reader. The humor of S. is the most subtle, airy, delicate, and tender in our literature; and in many passages he shows himself master of a pathos equally exquisite and refined, and quite irresistible. Though against the charge of unclerical levity, at once in his writings and his life, it is impossible to defend S. except as the laxer *morale* of his time may afford palliation of it, candid investigation suggests a considerably more kindly view of his character than that formerly current. Traill's short life of S. (1882) stands midway between Fitzgerald's apology (*Life*, 1864) and Thackeray's unsparing attack.

STERNHOLD, *stér'n'hôld*, THOMAS: one of the authors of the version of the Psalms formerly attached to the English Book of Common Prayer: b. Hampshire, England, toward the close of the 15th c. He held the office of groom of the robes to Henry VIII. and Edward VI., and died 1549. At the Reformation period, when the practice of singing metrical psalms—introduced by Clement Marot among the gay courtiers of Francis I.—came to be taken up by the Reformers, S. undertook to render the whole book of Psalms into English verse. He lived to complete only 21 psalms; and his version was published after his death under the title of *All such Psalm of David as Thomas Sternhold did in his Lyfe drawe into English metre* (Lond. 1549). S.'s labors were completed by John Hopkins and William Whittinghame, and first annexed to the Book of Common Prayer with the music attached, as *The Whole Booke of Psalmes, collected into English metre by Thomas Sternhold, John Hopkins, and others; compared with the Ebrue, with Notes to sing withal*. S. and Hopkins's psalms are very literal, but coarse and homely in phraseology. They were used in the church service of England till superseded by the version of Tate and Brady (pub. 1698), and in use in Scotland till the middle of the 17th century.

STERN'IDÆ: see TERN.

STERNO, *stér'nō* [Gr. *sternon*, the breast]: a prefix to some scientific terms, denoting relation to the sternum or breast-bone. STERNOCOS'TAL, a. -*kōs'tāl* [L. *costa*, a rib]: belonging to the region of the ribs; attached to the sternum.

STERNUM, n. *stér'nūm* [Gr. *sternon*, the breast, the chest]: the flat bone of the breast to which the ribs are jointed in front; the breastbone. STERN'NAL, a. -*nāl*, pertaining to the sternum.—See SKELETON.

STERNUTATION—STETHOSCOPE.

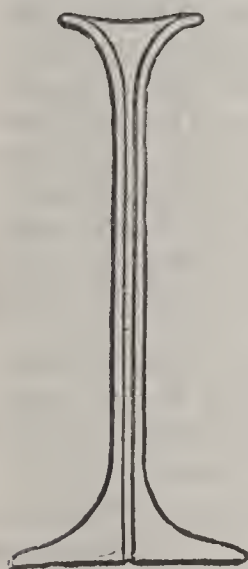
STERNUTATION, n. *stér'nū-tā'shūn* [L. *sternūto*, I sneeze]: the act of sneezing. **STERNUTATIVE**, a. *-nū-tā-tīv*, provocative of sneezing. **STERNUTATORY**, a. *-tēr-ĭ*, having the quality of provoking sneezing. **STERNUTATORIES**, n. agents which cause sneezing. The most common are various kinds of snuffs, but other substances are known which produce a more powerful and prolonged action on the nasal mucous membrane. Their uses in medicine are various; e.g., to restore suspended respiration in fainting, to dislodge foreign bodies from the nasal passages or even from the windpipe, to avert or check hysterical attacks, and to terminate prolonged fits of hiccup. They are now seldom used.

STERTOR, n. *stér'tōr* [L. *sterto*, I snore]: the deep snoring which accompanies respiration in certain diseases. **STERTOROUS**, a. *stér'tōr-ūs*, applied to the deep snoring, as in apoplexy, compression of the brain, etc.

STET, phrase, *stēt* [L., let it stand]: in *print.*, word written in the margin of a proof directing attention to a portion of the matter, and countermanding an order to expunge it; a series of dots made below the matter has the same effect. S. is often used as a verb, e.g., to *stet* a passage.

STETHOMETER, n. *stēth-ōm'ē-tēr* [Gr. *stēthos*, the breast; *metron*, a measure]: in *med.*, an instr. for measuring the capacity, and determining the form, of the chest.

STETHOSCOPE, n. *stēth'ō-skōp* [Gr. *stēthos*, the breast; *skopeō*, I view]: tube of light wood or gutta-percha, with one end funnel-shaped, used by medical men for listening to the sounds produced in the chest or other cavities of the body. **STETHOSCOPIC**, a. *-skōp'ik*, pert. to the stethoscope, or made by means of it. **STETHOSCOPY**, n. *stēth-ōs'kōpĭ*, the art of stethoscopic examination.—The *stethoscope* was invented by Laennec for examining the sounds of the



Stethoscope.

chest. Its simplest form is shown in the figure, which represents the section reduced to half the natural diameter, or one-eighth of the actual size. The upper part is the chest end, the lower the ear-piece. An improved form has two curved branches ending in small knobs, which are inserted in the ears of the auscultator. The most convenient dimensions are—length, 7 inches; diameter of ear-piece, 3 inches; circumference of shaft, $1\frac{1}{4}$ inch; diameter of chest end, $1\frac{1}{4}$ inch. The main object of the S. being to circumscribe and localize the sounds which it transmits, the chest end should be small, in order to determine the exact seat of the greatest intensity of sound. To ascertain this, the instrument should be moved right and left,

up and down, till its end is on the exact spot from which proceeds the abnormal sound for which we are searching—or, it may be, at which the absence of sound is located. See **AUSCULTATION**. In construction the following points

STETTIN—STEUBEN.

should be attended to: 1. It should be composed of a material which allows the least amount of sound to be lost and which least of all modifies or prevents the sound. A porous wood, such as cedar or deal, answers these conditions best, a dense wood, like ebony, having a tendency to modify the sound. 2. It should be of one piece of wood, not, e.g., part ivory and part cedar. 3. The ear-piece should be large and flat to secure perfect apposition and occlusion, and the chest end should be narrow and smoothly rounded over the edge. For the various sounds heard through the S., see PERCUSSION: RESPIRATORY SOUNDS: PNEUMONIA. ETC.—Also, see PHONENDOSCOPE.

STETTIN, *stët-tën'*: ancient town of Prussia, cap. of the province of Pomerania (*Pommern*), and, after Danzig, the most important seaport in the kingdom; on the left bank of the Oder (q.v.), where it flows into the Stettiner-Haff; 30 m. from the Baltic Sea, 83 m. n.e. of Berlin, with which it is connected by railway. Across the river, here 12 to 16 ft. deep, is the suburb of Lastadie, connected with S. proper by two bridges. Outside the fortifications are the suburbs Upper and Lower Wieck and Tornei. The site of the town is hilly and the streets are uneven; but the houses are good and the environs very pleasant. The principal buildings are the castle or fortress, the govt. house, the 'county buildings' with valuable library, the exchange, and theatre. The manufactures are very important; the chief silks, leather, sail-cloth, cottons, etc. There is also a large anchor foundry, where all the anchors for Prussian ships are forged. Ship-building and manufacture of machinery employ many workmen; and the commerce of the city is extensive and increasing. S. is the port whence mainly the products of Silesia, natural and artificial, are shipped to other countries. Grain, wood, and brandy are principal exports. The annual value of exports is about \$37,000,000; imports, about \$30,000,000. In 1885 there entered, 3,809 ocean vessels (2,207 steamers), besides 1,965 coasters and river craft, and 10,039 barges.—S. was formerly a fortress of the first rank.—The *Stettiner-Haff* is an expansion of the river Oder, n. of S., and communicates with the Baltic Sea by three narrow straits, the most important of which is the Swine; see SWINEMUNDE. The Stettiner-Haff has an area of 200 sq. m., and a depth of 12 to 18 ft.—Pop. (1880) 91,756; (1885) 99,543; (1890) 116,000; (1900) 210,702.

S. the anc. *Sedinum*, later *Stettinum*, was of Slavic origin, became a flourishing commercial town in the middle ages, joined the Hansa (see HANSEATIC LEAGUE) 1360, and was repeatedly the residence of the Dukes of Pomerania.

STEUBEN, *stü'bën*, Ger. *stoy'bën*, FREDERIC WILLIAM AUGUSTUS, Baron: general of the American revolutionary army: 1730, Nov. 15—1794, Nov. 28; b. Magdeburg, Prussia. He was educated at the Jesuits' Colleges of Niesse and Breslau; and at the age of 14 served as volunteer under his father at the siege of Prague. In 1747 he was appointed cadet of infantry, and 1758 had risen to adjt.gen. He was wounded in the battle of Kunersdorf; and 1761 was con-

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ducted as a prisoner of war to St. Petersburg, but was soon released. In 1762 he was appointed adjt.gen. on the staff of the Prussian king, effected important reforms in the quartermaster's dept., and superintended an acad. of young officers selected for special military instruction. At the close of the Seven Years' War he travelled in Europe, and was appointed grand marshal and gen. of the guard of the Prince of Hohenzollern-Hechingen. Visiting Paris 1777, where the American colonies in rebellion were favored by the government, he was invited by Count St. Germain to go to America; arrived at Portsmouth, Va., 1777, Dec. 1, and offered his services to Gen. Washington, which were joyfully accepted; and he joined the army, then in a most deplorable condition at Valley Forge. He was appointed inspector-gen., prepared a manual of tactics for the army, remodelled its organization, and improved its discipline. He was one of the officers who composed the court-martial at the trial of Major André. In the campaign of 1780 he had a command in Va., and was on the staff of Gen. Lafayette at the siege of Yorktown. Generous and noble in character, as he was capable as an officer, he spent his whole fortune in clothing his men, and gave his last dollar to his soldiers. Congress made tardy reparation, and 1790 voted him an annuity of \$2,500, and a township of land in N. Y., both of which he divided with his fellow-officers. He died on his estate near Utica, N. Y.—See Sparks's *American Biography*, and *Life* by Friedrich Kapp (New York 1860).

STEUBENVILLE, *stū'bén-vīl*: city, cap. of Jefferson co., O.; on the Ohio river, and on the Pittsburgh Cincinnati and St. Louis and the Cleveland and Pittsburgh railroads; 43 m. w. of Pittsburgh. It was named from Fort Steuben, a block-house built on its site about 1770 and abandoned 1787; settled 1797; and made a city 1851. It is on an elevated plain overlooking the river, which is here crossed by a railroad bridge; is the centre of a large bituminous coal-field; has 8 shafts in operation within its limits; and does large business by land and water. Farming and stock-raising are carried on extensively in its vicinity. The city has improved water and sewage systems, gas and electric light plants, the finest co. court-house in e. O. (cost \$300,000), 20 churches, high school, several grammar schools, girls' seminary, 2 national banks (cap. \$275,000), 2 priv. banks, and 2 daily and 3 weekly periodicals. The manufactures include paper, glass, woolen goods, white lead, machine-shop and rolling-mill products. In 1899-1900 there were 4,577 children of school age (6-21 years), of whom 2,226 were enrolled in the public schools, and the average daily attendance was 1,651; and public school property was valued at \$151,000. There were 6 public school buildings, with accommodations for 2,255 pupils; 55 teachers; expenditures (including \$29,229 for teachers' salaries), \$37,213; 1 high school. There are 2 Rom. Cath. schools with over 500 pupils, and several libraries. Pop. (1880) 12,093; (1890) 13,394; (1900) 14,349.

STEVEDORE—STEVENS.

STEVEDORE, n. *stě'vē-dōr*, or **STIVADORE**, n. *stīv'ă-dōr* [Sp. *estivador*, a packer of wool—from *estivar*, to pack or stow—from L. *stipārē*, to press together]: one engaged in the stowage or unloading of ships.

STEVEN, n. *stě'vn* [AS. *stefn*, the voice]: in *OE.*, a cry; loud clamor; appointed time; appointment.

STEVENS, *stě'venz*, ABEL, D.D.: b. Philadelphia, 1805, Jan. 19: author. He was educated in the Wesleyan Univ.: was pastor in Meth. Episc. churches at Boston and Providence; ed. of *Zion's Herald*, Boston, 1840-52; ed. of the *National Mag.*, N. Y., 1853-4, and of the *Christian Advocate*, New York, 1856; pastor in New York and Mamaroneck 1862-65; ed. of the *Methodist* 1865-74; pastor of the Union Church, Geneva, Switzerland; also travelled much. His principal works are: *Essay on Church Polity* (1847); *Memorials of the Introduction of Methodism into the Eastern States* (1847-52); a prize essay, *The Great Reform* (1856); *Hist. of the Religious Movement of the 18th Century, called Methodism* (1858-61); *Hist. of the Methodist Episcopal Church in the United States* (1864-67); *The Women of Methodism—Its Three Foundresses* (1866); *Madame De Staël* (1881); *Character Sketches* (1882). He died 1894, Dec. 3.

STEVENS, EBENEZER: soldier of the revolution: 1751, Aug. 22—1823, Sep. 2; b. Boston. He was one in the famous party which destroyed a quantity of tea in Boston harbor 1773; he raised troops in R. I., was in the expedition to seize Quebec, and was in command of the artillery at Ticonderoga, at Stillwater, and during a part of the siege of Yorktown. By various promotions he reached the rank of lieut.col. At the close of the war he entered mercantile business in New York, became a prominent citizen, and was made maj.gen. of the state militia. He died at Rockaway, L. I.

STEVENS, EDWARD: revolutionary soldier: 1745-1820, Aug. 17; b. in Culpeper co., Va. In 1776 he was appointed col. of the 10th Va. regt.; in 1777, Oct., was commissioned brig.gen., and was in the battles of Brandywine, Germantown, Camden, Guilford C. H., and at the siege of Yorktown. He was a state senator for Va. for 14 years. He died in Culpeper county.

STEVENS, EDWIN AUGUSTUS: 1795, July 28—1868, Aug. 8; b. Hoboken, N. J.; son of John S. (1749-1838). For some years he was engaged with his brother, Robert L. S., in the construction and improvement of steamboats and their machinery. He also had control of the Union line, which was later chartered for the brothers by the state of N. J. as the Camden and Amboy railroad: of this road S. was treas. and gen. manager. With his brother he made many improvements in engines, cars, and railroad construction; in engines for steam-vessels; and in naval batteries and defenses. He continued the latter work after his brother's death. During the civil war he built for the govt. a small twin-screw vessel, the *Naugatuck*, which could be almost entirely submerged, could be quickly raised to its ordinary level, and could be turned end for

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end in 75 seconds. He founded the Stevens Institute (q.v. at Hoboken, to which he bequeathed the land required, with \$150,000 for a building, and an endowment of \$500,000. He died at Paris.

STE'VENS, HENRY: 1819, Aug. 24—1886, Feb. 28; b. Barnet, Vt.; son of Henry S. He graduated from Yale 1843, and began the study of law; but becoming interested in antiquarian matters went to London 1845 in the interest of collectors of historical books and MSS. In a short time he was engaged by the authorities of the Brit. Museum to secure for them American books. He remained their agent through life, and also collected rare books for public and private libraries in this country. He made many valuable catalogues, edited works pertaining to early Amer. history, and was a prolific writer, and an authority, on biographical themes. Among his numerous works were: *Who Spoils Our New English Books?* (1885), and *Recollections of James Lenox* (1886). He died at South Hampstead, England.

STE'VENS, ISAAC INGALLS: soldier: 1818, Mar. 25—1862, Sep. 1; b. Andover, Mass. He graduated at West Point 1839, and was assigned to the dept. of engineers as 2d lieut. He served in the Mexican war, and was brevetted capt. for bravery at the battles of Contreras and Churubusco, and major at Chapultepec. 1849-53 he was in charge of the U. S. coast survey at Washington; 1857-61 delegate in congress from Wash. Terr.; 1861 col. of the 79th N. Y. vols. and brig.gen.; 1862, July 4, maj.gen. He was killed near Chantilly, Va., at the head of his command.

STE'VENS, JOHN: inventor: 1749-1838, Mar. 6; b. New York. After graduating from King's (now Columbia) College 1768, he studied law, was treas. of N. J. 1776-79 but gave most of his time to experiments and inventions. A petition which he offered to congress 1790 laid the foundation for the patent laws of this country. For many years he studied the problem of steam-navigation. With his son, Robert L. S., he completed, a few days after Fulton's successful trial on the Hudson, a boat which was used several years on the Delaware, and was the first steam-vessel ever moved on the ocean. He opened the first steam-ferry in the world; was the first to use the screw form of propeller in a steam-vessel; made improvements in engines; projected a railroad between New York and Philadelphia, for which 1815 he obtained the first charter ever granted for a railroad in the United States, though he did not build the road; and on a circular track which he constructed near his home he used the first locomotive ever run in this country. He died at Hoboken, N. J.

STE'VENS, JOHN AUSTIN: 1795, Jan. 22—1874, Oct. 19; b. New York; son of Ebenezer S. He graduated from Yale 1813, became a partner with his father in mercantile business in New York 1818, was one of the founders of the merchants' exchange, of which he was the first pres., was sec. of the chamber of commerce for several years, and pres. of the Bank of Commerce 27 years. In the civil war he was an earnest supporter of the govt. and was

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chairman of the bankers' committee which 1861 subscribed for a large portion of the 7-30 loan to the U. S. govt. He died at New York.

STE'VENS, PHINEAS: soldier: 1707, Feb. 20—1756, Feb. 6; b. Sudbury, Mass. Part of his childhood was spent at Rutland, N. H., to which place his parents had removed; but at the age of 16 he was taken prisoner by the Indians. In 1746 he joined the expedition against Canada; rendered distinguished service to the English cause in holding Fort No. 4 at Charlestown, N. H., when it was attacked by French and Indians 1747; was sent to Canada 1749 and again 1752 to secure an exchange of prisoners; and died in Nova Scotia while with Ccl. Monckton's expedition against the French. His *Journal*, narrating his experiences in Canada 1749, appears in the *New Hampshire Historical Collections*.

STE'VENS, ROBERT LIVINGSTON: civil engineer and inventor: 1787, Oct. 18—1856, Apr. 20; b. Hoboken, N. J.; son of John S. (1749-1838). In 1808 he made the first sea-voyage by steam, taking to Philadelphia the *Phoenix*, which was completed a few days after Fulton's Hudson river steamboat, 1807. He continued building steamboats until, in 1832, he attained with the *North America* the rate of 15 m. an hour. Thence, for many years, he was the recognized chief in this line of work; and made many improvements, such as ferry-boats and ferry-docks, truss-frames, wrought-iron walking-beam, split water-wheel, tubular boilers, etc. In 1830 he led the way in adopting the T-rail in this country. He invented the first efficient percussion-shell, and with his brother experimented on cannon-bombs and ship-armor. The so-called 'Stevens battery,' an iron-clad for which the U. S. govt. contracted 1842, anticipated by many years the European, but continued to be a subject of experiment (later by Edwin A. S.), as guns of greater penetrating power, invented from time to time, rendered its armor insufficient. S. died at Hoboken, in the mansion long conspicuous on Castle Hill.

STE'VENS, THADDEUS: 1792, Apr. 4—1868, Aug. 11; b. Danville, Vt. With the disadvantages of poverty and ill health, he found his way to the Univ. of Vermont, graduating at Dartmouth 1814. While teaching at York, Penn., he studied law; began practice at Bel Air, Md.; removed to Gettysburg, Penn., 1816, and soon became noted in his profession. He opposed the second election of Pres. Jackson. A member of the legislature 1833-35, he was active in saving the common-school system from its enemies. In the constitutional convention 1836, he advocated negro franchise. Again a member of the legislature 1837-8, he was a leader in the whig and anti-Mason body, after the division into rival organizations. In 1842 he removed to Lancaster, and was member of congress 1848-50, antagonizing the fugitive slave law and Clay's compromises. From 1858 to his death he was a member of the U. S. house of representatives, and much of the time its acknowledged radical leader, beloved by his friends and feared in debate by his

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enemies. The boldest resolutions and acts, during the war, were supported by him; and some, such as the 14th amendment, were originated by him. The proposal to impeach Pres. Johnson, 1868, came from him. Reports that he was skeptical and profane he took occasion to correct. His charities were many, and his will made provision for an orphan asylum at Lancaster, with no distinction of color. His burial was in a separate plot of ground given with the same condition. His epitaph, written by himself, states his wish to be buried where there is no restriction of color.

STEVENS INSTITUTE OF TECHNOLOGY: school of mechanical engineering at Hoboken, N. J., founded by Edwin A. Stevens (q.v.), who left by will, at his death, 1868, Aug. 8, a block of land, a building fund of \$150,000, and an endowment fund of \$500,000, to establish both an institute and a school preparatory to the institute and to any college. The site is a fine one, on high ground on the bank of the Hudson, opposite New York. The school, with a large new building on the e. side of the institute campus, completed in the spring of 1888, gives a three years' preparatory course, to about 250 boys, thoroughly fitting not only for scientific schools but for college or for business. The institute was organized under Henry Morton, PH.D., who took the presidency 1870. The United States, under act of congress 1869, authorizing a collateral inheritance tax, deprived the S. I. of \$45,000, which has not yet been refunded. Pres. Morton has made gifts to fit up the workshop with machine-tools (1881) \$10,500; to supply apparatus for a dept. of applied electricity (1883) \$2,500; and toward the endowment of a chair of engineering practice (1889) \$10,000. Dr. Jacob Vreeland left to the S. I., 1888, funds aggregating \$11,000. The high rank which the S. I. has taken, the distinction gained by its pres. and professors, the number of applicants for its advantages, only about half of whom can be received, indicate its need and its promise. New departments, new chairs, and scholarships are required. The full course occupies four years, and the degree conferred is that of mechanical engineer. The departments included in the course of study and drill are: mathematics and mechanics, physics, mechanical drawing, chemistry, with a cabinet of more than 3,000 specimens of ores, minerals, and rocks, analytical chemistry, engineering, experimental mechanics and shopwork, engineering practice, applied electricity, languages (Spanish and German), and belles-lettres. The workshop course includes visits to great establishments, where work on a large scale can be studied; and every senior class makes an extended tour of inspection through such centres of manufacturing as Bethlehem and Philadelphia, Penn.; Hartford, Conn.; Springfield, Boston, and Fall River, Mass.; and Providence, R. I. A special dept. of tests has been successfully maintained, to render any service by any kind of investigation for testing purposes—thus bringing study nearer to every-day demands. In this nearness of instruction to experience, and in the number of

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practical matters made familiar, the S. I. course is not second to any. The annual expenses of a student for books, board and tuition are estimated at \$500 to \$600.

Pres., Alex. C. Humphreys, PH. D. The faculty (1902-03) comprises 22 professors and instructors. The four classes number (1902-03) in the aggregate 297.

STEVENSON, ADLAI EWING: lawyer and politician: 1835, Oct. 23— ————; b. Christian co., Ky. He studied law in Bloomington, Ill.; was admitted to the bar 1858; master in chancery 1861-65, state's atty. for the 22d judicial dist. 1864-68; fixed his residence in Bloomington, and was elected as a democrat to Congress 1874-78; was first asst. postmaster-gen. 1885-89; and in 1893-97 was vice-pres. of the U. S. He was a member of the commission appointed 1897 to try to secure international bi-metal-lism; in 1900 was an unsuccessful candidate for vice-pres.

STEVENSON, *sté'ven-son*, ROBERT: Scotch engineer: 1772, June 8—1850, July 12; b. Glasgow. 1796 he succeeded his step father as engineer and inspector of light-houses; and during 47 years' tenure of that office planned and constructed no fewer than 23 light-houses round the Scottish coasts, employing the catoptric system of illumination, and his valuable invention of 'intermittent' and 'flashing' lights (see LIGHT-HOUSE). The most remarkable of these erections was that on the Bell Rock (q.v.) quite unprecedented in light-house engineering, for in the only instance analogous—the Eddystone (q.v.) light-house—the rock was barely submerged at flood, while the Bell Rock was never uncovered except at very low ebb-tides. S. was in great request also as consulting engineer in roads, bridges, harbors, canals, and railways; introduced many improvements in their construction; and occasionally co-operated with Rennie, Telford, and others. He died in Edinburgh. Besides professional printed reports, S. wrote a work on the Bell Rock Light-house, articles in *Encyclopædia Britannica* and *Edinburgh Encyclopædia*, and *Scots Magazine* (1817). See *Life* by his son, David S. (1878).

STEVENSON, *sté'ven-son*, ROBERT LOUIS BALFOUR: author: b. Edinburgh, 1850, Nov. 13. He was educated at the Edinburgh Univ.; studied civil engineering and law; was called to the Scottish bar; and became a traveller and author. He came to the United States 1879; made a cruise to the South Sea Islands 1888-9; and established himself on the island of Samoa 1890. Some of his writings have drawn wide attention by their display of a vivid and peculiar imaginative power. His publications include an account of his travels in Cal.; *Treasure Island* (1883); *Dr. Jekyll and Mr. Hyde* (dramatized 1888); *The Silverado Squatters*; *Familiar Studies*; *Prince Otto*; *The Blackamoor* (1889); *New Arabian Nights*; *Edinburgh: Picturesque Notes*; *In the Wrong Box*; *The Master of Ballantrae* (1889); *Ballads* (1890); and *The South Seas: Life under the Equator* (1891-2), etc. He d. 1894, Dec. 3.

STEVENS POINT—STEWARD.

STEVENS POINT: city, cap. of Portage co., Wis.: on the Wisconsin river, and on the Wisconsin Central and the Green Bay Winona and St. Paul railroads; 71 m. n. of Portage City, 85 m. w. of Green Bay. It is a supply and distributing point of one of the most valuable pine regions in the w.; has important lumber interests, and numerous saw, shingle, and planing mills; and contains 7 churches, 6 public schools, school property valued at \$38,500. Rom. Cath. acad., 2 national banks (cap. \$100,000), 1 state bank (cap. \$60,000), and 3 weekly newspapers. The machine and repair shops of the Wis. Cen. railroad are here.—Pop. (1880) 4,449; (1890) 7,896; (1900) 9,524.

STEVENSTON, *stē'venz-ton*: town of Scotland, county of Ayr, on the Ardrossan and Saltcoats branch of the Glasgow and Ayr railway; about three m. e. of Ardrossan. S. consists mainly of one low, straggling, uneven, and narrow street, about half a mile long; but the parish church is finely placed on a slight eminence which commands a splendid view of the Arran Hills and the lower scenery of the Firth of Clyde. The prosperity of S. now depends on the collieries and iron-works in its vicinity.—Pop. (1881) 3,556; (1891) 4,261.

STEW, v. *stū* [OF. *estuve*, a stove: Port. and Sp. *estufa*, a hothouse: Icel. *stofa*; Sw. *stufwa*, a heated confined space, a hot bath: Low Ger. *staven*, to stew]: to boil slowly with a little water; to be boiled in a slow gentle manner—simmering—with but little water: N. a vapor-bath: meat slowly boiled with but little water: in *OE.*, that which suffocates or stifles; that which chokes or stuffs; vapor; smoke; dust; a state of anxiety or confusion: a brothel. **STEW'ING**, imp. **STEWED**, pp. *stūd*. **STEW-PAN**, a kitchen utensil in which meat is stewed. Meat stewed is tender and savory, but not so digestible as when otherwise cooked. **IN A STEW**, in *common language*, in vexation and perplexity: perspiring from fear and confused exertion. **IRISH STEW**, a kind of hash, of potatoes and meat stewed together with only a little water.

STEWARD, n. *stū'érd* [Icel. *stivardr*, the person who looks to the daily work of an establishment: AS. *stiward*—said to be from *stigo*, a sty; *weard*, a guardian]: one who manages the affairs of a landed estate: one who regulates the domestic concerns of a great family, termed a *house steward*: director of a public dinner, charitable festival, and the like: in a *ship*, the person who superintends the meals, etc.; a manager: in *Scrip.*, a minister of Christ. **STEW'ARDESS**, n. *-ēs*, a woman who attends women traveling by vessel. **STEW'ARDSHIP**, n. *-shīp*, the office of a steward; management.

STEWARD (or **HIGH S.**) OF SCOTLAND (L. *Dapifer*, or *Seneschallus*): official of high dignity and power under the Scottish crown in the 12th, 13th, and 14th c. The high steward was chief of the household, collected and managed the crown revenues, and had the privilege of the first place next to the king in battle. The office was early in the 12th c. conferred by David I. on Walter, whose chief pat-

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rimony was the barony of Renfrew (q.v.); and the dignity of S. became hereditary in his family, who in virtue of their office assumed the surname Stewart (Stuart). The estates of the stewards afterward became the appanage of the king's eldest son, and 1469 the titles Prince and High Steward of Scotland, Duke of Rothesay, Earl of Carrick, Baron of Renfrew, and Lord of the Isles, were vested in the eldest son and heir-apparent of the crown of Scotland forever. 'Great Steward of Scotland' has thus become one of the titles of the Prince of Wales. See STUART, ROYAL HOUSE OF.

STEWARD OF ENGLAND, LORD HIGH: one of the great officers of state, anciently the first officer of the crown. The dignity was in early times hereditary. The office was absorbed into the royal dignity on the accession of Henry IV., and there has since been no permanent lord steward; but the office is temporarily revived when occasion requires, e.g., at a coronation (see PARLIAMENT): when the proceedings are at an end, the lord steward terminates his commission by breaking his wand of office.

STEWARD OF THE HOUSEHOLD, LORD: official of the royal household in England, of great antiquity; originally designated the Lord Great Master of the Household. He is head of the ancient court called the *Board of Green Cloth*; and as such has control of all the officers and servants of the household, except those belonging to the chapel, the chamber, and the stable: to his charge pertain household purveyance and expenditure. The judicial authority of this ancient court long ago fell into disuse, and was abolished early in Queen Victoria's reign. The S. of the H. is always a member of the privy council, and has precedence of all peers of his own degree; receives his charge from the sovereign in person, with a white wand as his badge of office; holds his appointment during pleasure; and his tenure depends on that of his political party: the salary is £2,000.

STEWART, *stū'ért*, ALEXANDER TURNEY: merchant: 1803, Oct. 12—1876, Apr. 10; b. Lisburn, near Belfast, Ireland; of Scotch ancestry. After good education with reference to the ministry, he came to New York 1823, taught a private school, and, returning to Ireland to receive his patrimony, invested it in the best class of Irish textile fabrics, which brought him rich custom when he opened a store in New York 1825. He erected the great marble store, Broadway and Chambers st., which became his wholesale department after he built the iron structure on Broadway, 9th and 10th sts. The latter cost \$2,750,000, and the annual sales of the two establishments amounted to \$200,000,000. His business made it legally necessary for him to decline Pres. Grant's offer of the U. S. treasury portfolio. He sent as gift a ship-cargo of provisions to relieve the Irish famine 1846; another to France after the Franco-Prussian war; \$50,000 to the sufferers of the Chicago fire 1871, and \$10,000 to those who suffered from floods in Silesia. Garden City, Long Island, was

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founded by him for the sake of his army of employés and others of small means, and he was building a home for working-girls, 4th avenue, 32d-33d sts., but since his death it has been converted into a hotel. His palace-home of marble, 5th ave. and 34th st., is now occupied by the Manhattan Democratic Club. The fortune left by him was said to be \$40,000,000; but neither its amount nor the disposition of it since is publicly known. His body was stolen from its grave to secure ransom; but is generally believed to have been recovered, and interred in the splendid mausoleum at Garden City.—His widow, Cornelia Clinch S., built the superb Cathedral of the Incarnation (Prot. Episc.) at Garden City, and endowed it with an annual income of \$15,000.

STEW'ART, BALFOUR, LL.D., F.R.S.L.: physicist: 1828, Nov. 1—1887, Dec. 21; b. Edinburgh. He was educated at St. Andrews and Edinburgh universities; became director of the Kew Observatory 1859; and was prof. of nat. philosophy in Owens Coll., Manchester, 1870 till his death. S. was discoverer of the law of equality between the absorptive and radiative powers of bodies. Among his published works are: *Researches on Solar Physics*; *Elementary Treatise on Heat*; *Elementary Physics*; *Conservation of Energy*. He wrote numerous papers on meteorology and on magnetism. In conjunction with Prof. Tait he wrote *The Unseen Universe*, a work which made a profound impression, and which went through 12 editions. At his death he was pres. of the London Physical Soc. and of the Soc. for Psychical Research.

STEW'ART, CHARLES: naval officer: 1778, July 28—1869, Nov. 6; b. Philadelphia; familiarly known as 'Old Ironsides.' He was of Irish descent, became cabin-boy in the merchant marine 1791, and was rapidly promoted; became lieut. in the U. S. navy 1798, was in command of the *Experiment* 1800, and rendered valuable service by capturing privateers. He served with distinction under Preble in the movement against Tripoli 1804, and was one of the officers thanked by congress for their achievements; was again connected with the merchant marine; but on the opening of the war of 1812 re-entered the navy. He commanded the *Constellation*, aided in the defense of Norfolk against a British fleet, afterward commanded the *Constitution*, and took many prizes; received a gold medal, a sword, and a vote of thanks from congress, and other public recognition; was in command of the Mediterranean squadron 1816-20, the Pacific squadron 1820-24, and at various times of the navy-yard at Philadelphia. He became rear-admiral 1862. His service in the navy covered more than 70 years. He died at Bordentown, N. J.—Admiral S. was grandfather of the Irish leader Charles Stewart Parnell.

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STEW'ART, DUGALD: eloquent lecturer on the Scottish philosophy: 1753, Nov. 22—1828, June 14; b. Edinburgh: son of Matthew S., prof. of mathematics in the Univ. of Edinburgh. After five years at the high school, he entered the univ. in his 13th year, graduating 1769. While S. gave his attention largely to metaphysics, logic, rhetoric, and moral philosophy, he made great attainments also in mathematics, natural philosophy, and classics. In 1771, he studied at Glasgow, through one session, attending the lectures of Dr. Reid, and living in the same house with Archibald Alison (q.v.), and the two became intimate friends. In his 19th year he was called by his father, whose health was failing, to teach the mathematical classes in the Univ. of Edinburgh; 1775, he was elected joint prof., holding that post till 1785. In 1778, in Adam Ferguson's absence on a political mission to America, S. taught the moral philosophy class also. His lectures were wholly his own, and were delivered from notes, as was his practice in after years. At the resignation of Ferguson 1785, he was appointed prof. of moral philosophy, and served actively 25 years. He had a rare gift of didactic oratory, and his lectures were greatly admired and numerously attended. He went over a wide compass of subjects: Psychology, or the Science of Mind proper, Metaphysics, Logic, Ethics, Natural Theology, Principles of Taste, Politics, and last of all, Political Economy, which, from 1800, he treated in a separate course. In 1792, appeared vol. I. of his *Elements of the Philosophy of the Human Mind*. In 1793, he published his *Outlines*. He read before the Royal Soc. of Edinburgh 1793, his *Account of the Life and Writings of Adam Smith*; in 1796, *Account of the Life and Writings of Principal Robertson*; and 1802, *Account of the Life and Writings of Dr. Reid*. In 1805 he was prominent in the Leslie controversy; setting forth the facts in a pamphlet; also, in the gen. assembly, giving vent to his indignation at the proceedings against Leslie (see LESLIE, Sir JOHN). In 1806, on the accession of the whig party to power, he received a sinecure office worth £300 a year. The death of his second son, 1809, gave a blow to his health, and he was unable to lecture during part of the following session; Dr. Thomas Brown (q.v.) at his request acting as his substitute: the following year, Brown was appointed conjoint prof., and taught the class till his death 1820. From 1809, S. lived in comparative retirement at Kinneil House, Linlithgowshire, which the Duke of Hamilton placed at his service. In 1810, he published *Philosophical Essays*; 1814, vol. II. of the *Elements*; 1815, the first part, and 1821, the second part of the *Dissertation on the History of Ethical Philosophy*; 1827, vol. III. of the *Elements*; and 1828, a few weeks before his death, *Philosophy of the Active and Moral Powers*.

On the death of Brown, S. retired altogether from the professorship, and was succeeded by John Wilson ('Christopher North').

The philosophy of S. was but the continuance of the reaction begun by Reid (see REID, THOMAS) against the

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skeptical results that Berkeley and Hume drew from the principles of Locke. Both Reid and S. professed the Baconian method of observation and induction as against mere ontology, but considered that these processes of investigation could establish certain ultimate truths of a higher certainty than themselves. Hence arose the principles of common sense of Reid, in which S. for the most part acquiesced (see COMMON SENSE, THE PHILOSOPHY OF). S. also followed and improved upon Reid in that systematic exposition of all the powers of the mind which had rendered mental philosophy for the first time a subject of study, independent of metaphysical, logical, and ethical applications; though he also followed it out in all these directions with his usual felicity of exposition. His contributions to the philosophy of Taste, in the *Philosophical Essays*, are among the best of his writings.

On the whole, though S. was not one of the original thinkers in his department, yet, by the impressive eloquence and the moral elevation of his teaching and the compass of his writings, he did much to diffuse an interest in speculations concerning the human mind. His collected works have been edited by Sir W. Hamilton, 11 vols., to which Prof. Veitch has contributed a biography.

STEWART, FAMILY of: see STUART, ROYAL HOUSE OF.

STEWART, HAMILTON: pioneer: b. Ky., 1813. He removed to Texas, and 1838 established the *Civilian*, a democratic newspaper, which he edited for a long period. He was prominent in the political affairs of Texas, was repeatedly elected mayor of Galveston, which city he represented 1856 in the constitutional convention; strongly preferred independence to admission to the Union; but in the early years of the secession agitation threw his influence against secession. He was collector of the port of Galveston in the administrations of Pres. Pierce and Pres. Buchanan, and for many years was on the editorial staff of the *Galveston News*.

STEWART, JOHN: revolutionary soldier: b. Ireland; brother-in-law of Gen. Wayne. He emigrated to the Amer. colonies, and entered the army, where he was given command of a corps of light infantry. For bravery at the storming of Stony Point 1779, July 15, congress voted him a gold medal. He died near Charleston, S. C., by being thrown from his horse.

69, 87, 93, and 99.

STEWART, WILLIAM MORRIS: lawyer and politician: 1827, Aug. 9— ———; b. Lyons, N. Y. He left Yale Coll. to go to Cal. 1849, where he engaged in mining; studied law, and was appointed atty.gen. of Cal. 1854; in 1860 removed to Nevada, where he was prominent in developing the famous Comstock lode; was member of the territorial council 1861; was elected U. S. senator 1864, 69, 87, and 93. He has been in much mining litigation.

STEWARTON, stū'ér-ton: town of Scotland, county of Ayr, on the right bank of the Annock, five m. n.w. of Kilmarnock. Pop. (1891) 2,687.

STEWARTRY—STICHO-

STEWARTRY, *stū'ért-rĭ*, in Scotland: district governed by a steward, an officer appointed by the king with jurisdiction over crown-lands, and powers similar to those of a lord of regality—having the civil jurisdiction of a sheriff, with a criminal jurisdiction much more extensive. The only remaining trace of this jurisdiction is the term S. applied instead of county to the district of Kirkcudbright. See GALLOWAY.

STEYR, or **STEIER**, or **STEYER**, *stĭ'ér*: town of Upper Austria, on an island at the confluence of the Steyr and the Enns, 23 m. s.e. of Linz, 92 m. w.s.w. of Vienna. It is a great seat of the iron and steel manufactures of Austria, and has important manufactures of paper, woollens, and hosiery. Its small-arms factory is the largest in Austria. Near the town is the castle of the princes of Lamberg, dating from the 10th c. S., formerly belonging to Styria, has been Austrian since 1192.—Pop. (1890) 21,499.

STHAVIRA [Skr., old]: in Buddhist hierarchy, the 'elders' or 'venerables,' who, after the death of *the* Buddha S'âkyamuni, taught the doctrine, presided at the Buddhist assemblies, etc., and, since the time of As'oka, were invested with a kind of episcopal power. In the sectarian history of Buddhism, S. is the name of those Arhats who did not follow the schism of the Mahâsânghikas (q.v.). There are also other accounts of it.—See C. F. Koeppen, *Die Religion des Buddha* (Berlin 1857); W. Wassiljew, *Der Buddhismus, seine Dogmen, Geschichte, und Literatur* (St. Petersburg 1860).

STHENIC, a. *sthĕn'ĭk* [Gr. *sthenos*, strength]: in *med.*, attended with a morbid increase of vital action—applied to diseases; opposed to *asthenic*, or diseases of debility.

STIBIAL, a. *stĭb'ĭ-ăl* [L. *stibium*; Gr. *stimmi*, antimony]: having the qualities of antimony; antimonial. **STIBIATED**, a. *-ă-tĕd*, impregnated with antimony. **STIB'NITE**, n. *-nĭt*, sulphide of antimony; the principal ore of antimony, occurring in very long prismatic or acicular crystals, or in a fibrous form—this ore has been in use among oriental nations from a very remote period for staining the eyelids—also called **ANTIMONITE**. **STIB'IUM**, n. *-ĭ-ŭm*, antimony; stibnite.

STICH, n. *stĭk* [Gr. *stichos*, a row, verse]: a verse or line in poetry; a line from the Scriptures; a row of trees. **STICHOMANCY**, n. *stĭk'ō-măn'sĭ* [Gr. *mantei'ă*, divination]: divination from the assumed meaning of a line or verse, taken at hazard, as from Scripture. **STICHOMETRY**, n. *stĭk-ŏm'ĕ-trĭ* [Gr. *metron*, a measure]: a catalogue of the books of Scripture, with the number of verses each one contains.

STICHIDIA, n. plu. *stĭk-ĭd'ĭ-ă* [Gr. *stichos*, a line; *eidos*, appearance]: in *bot.*, lance-shaped receptacles for the spores of some algæ.

STICHO-, prefix, *stĭk-o*: having rod-like processes.

STICK—STICKLEBACK.

STICK, n. *stīk* [AS. *sticca*; Icel. *stika*, a stick: Dut. *steken*; Ger. *stecken*, to stick into, to come to a stand: Icel. *stika*, to drive piles: Dan. *stikke*, to prick, to stab]: a long, small piece of wood; a stem or branch of a tree cut for fuel; a rod; a stab; a thrust or sharp blow with a pointed instr.; in *common usage*, a poor preacher or speaker: V. to pierce; to stab, as animals; to fix in or on; to hold or cleave to; to adhere closely; to remain, as in the memory; to be hindered from proceeding; to set with something pointed; to be constant or firm; to resist efforts to remove; to scruple; to hesitate. **STICK'ING**, imp.: **ADJ.** adhering: N. act of one who or that which sticks. **STUCK**, pt. pp. *stūk*, hindered from proceeding; fixed in. **STICKY**, a. *stīk'ī*, having the quality of adhering to a surface; gluey. **STICK'INESS**, n. *-nēs*, the quality of being sticky; adhesiveness; tenacity. **STICK-LAC**, lac in its natural state. **To STICK AT**, to hesitate. **To STICK BY**, to adhere closely; to be firm in supporting. **To STICK OUT**, to project; to be prominent; to refuse compliance. **To STICK TO**, to adhere closely. **CUT YOUR STICK**, make your mark on the tally or stick and pass on; be off instantly: see **NICK**.

STICKING-PLASTER, or **COURT PLASTER**: adhesive plaster for closing wounds or for covering an injured part. It is prepared in the following manner: Two solutions are made, one of an ounce of isinglass in eight ounces of hot water, the other of two drachms of gum-benzoin in two ounces of rectified spirit: these solutions are strained and mixed. Several coats of this mixture, kept fluid by gentle heat, are applied with a camel's-hair brush to a piece of black silk stretched on a frame, each coat being allowed to dry. A layer of a solution of one ounce of Chian turpentine in two ounces of tincture of benzoin, is then applied to the other side of the silk, and allowed to dry. Instead of the black S. P., colorless plaster, or *Gold beater's Skin* (q. v.), is often preferred.

STICKLE, v. *stīk'l* [OE. *sticklers*, persons appointed to see that the parties in a combat had fair-play; proper form *stightlers*—from AS. *stihtian*, to govern, to dispose]: to take part with a side; to contend; to wrangle; to go from side to side. **STICK'LING**, imp. *-līng*. **STICK'LED**, pp. *stīk'ld*. **STICK'LER**, n. *-lēr*, one who obstinately contends about a thing. **To STICKLE FOR**, to maintain one's rights.

STICKLEBACK, n. *stīk'l-bāk* [AS. *sticel*, a prickle, and Eng. *back*]: fish, of various genera and species of the family *Gasterosteidae*, in which the first dorsal fin is represented by a number of detached spines, a single strong spine occupies the place of the ventral fins, there are only three branchiostegal rays, the gill-covers are not armed, and the body is mailed by plates on the lateral line, and destitute of scales. Some of the characters are so different from those of *Teleocephali*, that the family, with several others, has been made an order or sub-order, *Hemibranchii*. The species are found in fresh and brackish waters, and in the sea, in cold and temperate regions; and are small fishes, interesting from their habits and the beauty of their

STICKY—STIFF.

colors, which they change remarkably, partly according to the colors of surrounding objects, partly through the influence of their own passions. A species having three spines instead of the first dorsal, is extremely abundant in rivers, ponds, and brackish waters in most parts of Europe, and is sometimes found in the sea. A marine species, with 14-15 spines, is common on the n. coasts of Europe. *Gasterosteus biculeatus*, with 2 spines, is found n. of New York, and is 2 in. long and of greenish color; also a four-spined species. Sticklebacks caught in a river readily accommodate themselves to a salt-water aquarium. The S. seldom exceeds two inches and a half, or three inches in length. The common fresh-water species are seldom used as food, yet they are said to be excellent for this purpose. Oil has sometimes been expressed from them. In the aquarium, or in their native waters their combats are very amusing. They are excessively pugnacious, particularly at the breeding season, when each male S. appropriates a certain territory which he holds fiercely against all intruders, and into which he introduces the females. The larger often devour the smaller, and they destroy the fry of fishes to a prodigious extent; they feed also on aquatic larvæ, and are probably of great use in preventing the excessive multiplication of many kinds of insects. A small S. in an aquarium devoured in five hours 74 newly-hatched dace about a quarter of an inch long. Their nest-building, which is particularly interesting, was the first observed among fishes. They collect small pieces of straw or stick, with which the bottom of the nest is laid among water-plants, and these they cement together by an exudation from their own bodies, which forms a thread through and round them in every conceivable direction. The thread is whitish, fine, and silken. The sides of the nest are made after the bottom. The nest of the Fresh-water S. is about the size of a small hazel-nut: the eggs, about the size of poppy-seeds, are deposited within. The male makes the nest, into which he introduces the female for laying the eggs, and he afterward watches it with great care—necessary because the eggs are acceptable food to any other stickleback.

STICKY: see under STICK.

STIFF, a. *stif* [Ger. *steif*; Dan. *stiv*; Dut. *stijf*; Sw. *styf*, stiff: L. *stipārē*, to pack close]: not easily bent; not pliant; rigid; rather hard than soft; strong; not giving way; stubborn; firm in perseverance or resistance; not natural and easy, as manners; affected; constrained; not written with ease; formal; impetuous in motion, as a breeze. STIFF'LY, ad. *-lī*, rigidly; inflexibly; strongly. STIFF'NESS, n. *-nēs*, the state of being stiff; want of flexibility; stubbornness; the state of being harsh and constrained. STIFF-HEARTED, a. obstinate; stubborn. STIFF-NECKED, a. stubborn; inflexibly obstinate. STIFFEN, v. *stif n*, to make stiff; to become stiff; to grow hard; to become less susceptible of impressions. STIFFENING, imp. *stif'ning*: ADJ. becoming or growing stiff: N. something used to make a substance more stiff. STIFFENED, pp. *stif nd*. STIFFENER,

STIFF-NECK—STIGMA.

n. *stīf'nēr*, that which stiffens. **STIFF'ISH**, **a.** *-ish*, somewhat stiff.—**SYN.** of 'stiff': rigid; inflexible; strong; hardy; obstinate; pertinacious; harsh; starched; rigorous;—of 'stiffness': rigidity; tension; contumaciousness; constraint.

STIFF-NECK, or **WRY-NECK**, or **TORTICOLLIS**: condition of the neck in which lateral movement of the head causes great pain, and which is due to rheumatism of the muscles on the side of the neck, especially the sternomastoid. The condition may be either temporary or permanent: in the latter case the surgeon may have to divide the contracted muscles. But usually S.-N. is only a temporary affection. In the great majority of cases, only one side of the neck is affected, the head being drawn more or less obliquely toward that side; but occasionally both sides are equally attacked, in which case the head is held stiffly erect and looking straight forward. As long as the head remains at rest, there is merely discomfort; but every movement is extremely painful. This affection is caused usually either by exposure of the part affected to a current of cold air, or by wearing wet or damp clothes round the neck. In addition to the ordinary treatment of sub-acute Rheumatism (q.v.), application of heat will often be advantageous.

STIFLE, **v.** *stī'fl* [*Icel. stífla*, to stop, to dam: *Norw. stívla*, to check: *Dan. stive*, to stiffen (see **STIFF**)]: to stop the breath; to suffocate; to choke; to smother; to conceal; to suppress; to hinder from spreading, as a report. **STIFLING**, **imp.** *-fling*: **ADJ.** causing a feeling of suffocation. **STIFLED**, **pp.** *stī'fld*, suppressed; suffocated.

STIGMA, **n.** *stīg'mă*, **plu.** **STIG'MAS**, *-măz*, or **STIG'MATA**, *-mă-îă* [*L. and Gr. stigma*, a mark made with a sharp-pointed instr.—from *Gr. stizō*, I mark with points]: anything which tarnishes character or reputation; any mark of infamy; in *bot.*, the receptive upper portion of the pistil on which the fertilizing pollen falls (see **PISTIL**). **STIG'MATA**, **n. plu.** the spiracles or breathing-pores of insects: the marks of the wounds on Christ's body, or marks resembling them (see **STIGMATIZATION**). **STIGMATIC**, **a.** *stīg-măt'ik*, or **STIGMAT'ICAL**, **a.** *-î-kăl*, branded or marked with a stigma. **STIGMATIC**, **n.** in *OE.*, one who has a natural deformity. **STIGMATICAL**, **a.** in *OE.*, pertaining to one with a natural deformity. **STIGMAT'ICALLY**, **ad.** *-lî*, in the way of a stigma; in *OE.*, with a mark of infamy or deformity. **STIGMATIZE**, **v.** *stīg'mă-tîz*, to set a mark of disgrace on; to denounce as infamous. **STIG'MATIZING**, **imp.** **STIG'MATIZED**, **pp.** *-tîzd*, marked with disgrace (also, see **STIGMATIZATION**). **STIGMARIA**, **n.** *stīg-mă'rî-ă*, in *geol.*, root-stems peculiar to the carboniferous system, so named from their regular pitted or dotted surfaces: see **SIGILLARIA**.

STIGMATIZATION.

STIGMATIZATION [Lat. *stigmatizatio*, a branding, puncturing—from Gr. *stigma*, puncture, brand]: name applied, by the mystic writers of the Rom. Cath. Church, to the supposed miraculous impression on certain individuals of the 'stigmata,' or marks of the wounds which Christ suffered during his Passion: to these the apostle Paul is by some supposed to allude (Gal. vi. 17): 'I bear branded on my body the marks (Gr. *stigmata*) of Jesus.' These stigmata comprise not only the wounds on the hands and feet, and that on the side, received in the crucifixion, but also those impressed by the crown of thorns and by the scourging. The impression of the stigmata, being held to be miraculous, was regarded as a mark of the signal favor of Christ, manifested to those especially devoted to the contemplation of his Passion. The most remarkable example of S. is referred to in the memoir of FRANCIS OF ASSISI (q.v.), and is said to have occurred on the mountain of Alverno, 1224, Sep. 14, two years before the death of Francis. (But Francis was not the first *stigmatizatus*, for a church council at Oxford, 1222, condemned an impostor who pretended that his body bore the miraculous stigmata.) Being absorbed, according to the account of his biographers, in profound and rapturous contemplation of the Passion of Christ (the day being the feast of the Exaltation of the Cross), he saw, as it were, a seraph with six shining wings, blazing with fire, having between his wings the figure of a man crucified, descend from heaven, and approach him, so as to be almost in contact. After a time, the vision disappeared, but left the soul of Francis filled with reverence and awe; and on his return to calmer thought, he became aware that his body had received externally the marks of the crucifixion. His hands and feet seemed bored through with four wounds, and these wounds appeared filled with nails of hard flesh, whose heads protruded and appeared on the palms of his hands, and on the instep, while the points protruded on the opposite side, and seemed as if clinched with a hammer. His side, moreover, presented a red wound, as though from the point of a lance, and this wound occasionally gave forth blood. These mysterious marks continued, and it is recorded, were frequently seen by St. Bonaventure, by Pope Alexander IV., and by others during the two years from this date to the death of Francis; and they were seen by multitudes after his death.

This is not the place for discussion of the origin or the nature of this phenomenon; but it may be remarked that analogous effects are believed by mesmerists to be produced in somnambules under the influence of animal magnetism; see J. Ochorowicz, *Mental Suggestion* (New York 1891). The case of Francis of Assisi is not solitary in ecclesiastical history: very many others are recorded as having received all or some of the stigmata. The cases of women are more numerous than of men. A very remarkable one is that of Veronica Giuliani 1694, who is related to have received first the marks of the crown of thorns, and afterward those of the crucifixion; Gabriella da Pie-

STILAGINACEÆ—STILE.

zolo of Aquila is recorded to have received the mark of the lance 1472; Clara di Pugny, tertiary of the Dominican order, was similarly impressed 1514; and Cecilia di Nobili of Nocera 1655. Catherine di Raconisio is alleged to have been marked with the crown of thorns 1583; likewise several others, e.g., Maria Razzi of the island of Chio; Maria Villani, Vincenza Ferreri of Valencia; and Joanna Maria of the Cross, a nun of St. Clare, at Roveredo. In some cases, the visitation, though said to be accompanied with excruciating pain in the seat of the several wounds, was unattended by any external marks: such was the case of St. Catherine of Siena (d. 1380), of Ursula Aguirre—otherwise known as Ursula of Valencia—of Mary Magdalen di Pazzi, and of Mechtildis von Stanz: in other cases the wounds were in part visible, in part invisible. Thus, Hieronyma Carvaglio suffered the pain of the wounded hands and feet without any external mark, while the lance-wound was not only visible in her side, but was reported to bleed every Friday, the day specially devoted to the commemoration of the Passion. Blanca de Gazeran experienced the sensation of pain in the seat of each one of the wounds, but the mark of the nail was visible on the right foot only. Similar variety of sensation is recorded in other cases.

In a monograph on the subject (*Les Stigmatisés*, pub. 1873), Imbert-Bourbeyre enumerates 145 persons branded with the stigmata; of these 20 are men, the rest women. Of the 145, 80 lived before the 17th c. There have been several cases of S. in the 19th c.—the most famous in recent times that of Louise Lateau, on whom the stigmata appeared 1868, Apr. 24: her case was investigated by Prof. Lefebvre of Louvain, for 15 years physician to two lunatic asylums: she had a periodic bleeding of the stigmata every Friday, and the hystero-cataleptic condition often recurred. A Prot. young woman of Saxony was marked with the stigmata 1820.—The great repertory for this and like phenomena is Görres's celebrated work, *Christliche Mystik*: for critical study of S. as a pathological phenomenon, see Berjon's *La Grande Hystérie chez l'Homme*; Beaunis's *Recherches sur l'Activité cérébrale*.

STILAGINACEÆ, *stīl-āj-īn-ā'sē-ē*: natural order of exogenous plants, allied to *Urticeæ*, containing about 20 known species of trees and shrubs, natives of the E. Indies, Mauritius, and Madagascar: none are important.

STILBITE, n. *stīl'bīt* [Gr. *stillō*, I shine]: a hydrous silicate of alumina and lime, occurring in broad pyramidal crystals, varying in color, found most frequently in traps and amygdaloids (see ZEOLITE). STILBENE, n. *stīl'bēn*, a hydrocarbon of the aromatic series.

STILE, n. *stīl* [AS. *stigel*, a step—from *stigan*, to climb: Low Ger. *stegel*, steps in a wall for getting over]: a series of rude steps for getting over a wall or fence.

STILE, n. *stīl* [see STYLE]: the pin on the face of a dial required to project a shadow. STILAR, a. *stī'lēr*, pertaining to the stile of a dial.

STILES—STILICHO.

STILES, *stīlz*, EZRA, D.D., LL.D.: 1727, Dec. 10—1795, May 12; b. North Haven, Conn.: Congl. minister, and pres. of Yale Coll. After graduation at Yale 1746, he was tutor there 1749–55, and, while so employed, ‘performed the first electrical experiments ever made in New England;’ also studied theology, and preached. Turning to law, he practiced in New Haven 1753–55, giving a Latin oration in honor of Benjamin Franklin’s visit to that city 1755. Resuming ministerial work, he was Congl. pastor at Newport, R. I., 1756–77. The war dispersing his congregation, he was pastor of the North Church, Portsmouth, N. H., until 1778, when he entered on the presidency of Yale, having been elected the previous year, and continued in the office until his death, and in that office teaching eccl. hist. and theol., and giving weekly scientific lectures. He was a man of great assiduity and extensive learning. Besides sermons and several Latin orations, he pub. *Account of the Settlement of Bristol* (1785), and *History of Three of the Judges of Charles I.* (1795).

STILETTO, n. *stī-lēt’ tō* [It. *stiletto*—from *stilo*, a dagger—from L. *stilus*, a pointed instr. for pruning or writing]: a dagger with a round-pointed blade; a pointed instr. for piercing holes: V. to stab with a stiletto. STILET’TOING, imp. STILET’TOED, pp. *-tōd*.

STILICHO, *stīl’-ī-kō*, FLAVIUS: celebrated Roman general and statesman, mainstay of the Western Empire after the death of Theodosius (q.v.) the Great: about 359–408, Aug. 23; of Vandal origin, son of a capt. of barbarian auxiliaries in the imperial army. He rose through his military talent to high rank in the army, and Emperor Theodosius sent him as ambassador to Persia, and on his return from the successful mission gave him his niece Serena in marriage. S.’s promotion aroused the jealousy of Rufinus, the able but evil-minded and ambitious minister of Theodosius, and caused an inextinguishable feud between the two. In 394, S. departed for Rome in charge of the youthful Honorius (q.v.), placed him on the throne of the Western Empire, and administered in his name the affairs of state. On the death of Theodosius, toward the close of 394, the quarrel for supremacy between S. and Rufinus, the guardian of Arcadius (q.v.), became fully developed, and Alaric (q.v.), at the instigation of the latter, invaded Greece while S. was chastising the invaders of the Roman territories on the Rhine and in Gaul. S. returning, set out for Constantinople, and ended the struggle between himself and Rufinus by the destruction of his rival 395. He then marched against Alaric, blocked him up in the Peloponnesus, but, through over confidence, permitted him to escape across the isthmus with his captives and booty. In 398, his daughter Maria became the wife of Honorius. His old opponent, Alaric, after several inroads on the e. provinces of the Western Empire, invaded n. Italy, but was signally defeated at Pollentia (403, Mar.) by S., who had hurriedly called in the Roman legions from Rhætia, Gaul, Germany, and even Britain. Alaric was

STILL.

again defeated at Verona, and retired from the empire; and S. obtained the honor of a triumph at Rome, with great increase of influence and power. S.'s ambition now led him to attempt the introduction of his own family to the imperial succession (a statement disbelieved by Gibbon, who considers it an invention of the crafty Olympius; though the great historian of the Roman Empire honestly confesses to various heavy blots on the character of his hero), by the marriage of his son with the heir-presumptive Placidia, daughter of Theodosius; and to attain this end, he made overtures of alliance to Alaric, which were gladly accepted. But the dreadful inroad of Radagaisus, 406, at the head of more than 200,000 (some say 400,000) barbarians, who ravaged the whole country as far as Florence, compelled the great general of the West to lay aside for a time his ambitious schemes. With a small but chosen army of veterans, aided by a body of Huns under Uldin (father of Attila), and of Visigoths under Sarus, he so harassed the invaders, that they were forced to give him battle. They were soon routed. Radagaisus, who surrendered, was put to death, and his followers were sold as slaves. S. resumed his pet scheme; established enmity between Rome and Byzantium by seizing on Eastern Illyricum and inducing Alaric to transfer his allegiance to Honorius. But Honorius, who had been prejudiced against S. by one of his officers, Olympius (see Gibbon's view above) refused to take E. Illyricum from the Byzantine Empire; and subsequently, by an artful harangue, he so influenced the soldiers of the army of Gaul, that they rose *en masse* against the partisans of Stilicho. S. himself was at Bologna; and on the news of the *émeute*, his most zealous friends urged immediate action against Olympius and the Pavian rebels; but for the first time in his life, vacillation (due as some think to his loyalty), seized S., and he declined. His party then, for self-preservation, turned against him; and one of them, Sarus, the Goth above mentioned, drove him out of his camp, and compelled him to flee to Ravenna, where he was soon afterward induced by false promises to surrender himself, and was beheaded. Thus perished S.—the last of the series of distinguished aliens, who, as emperors, warriors, or statesmen, had propped up the Roman Empire for 150 years, with a stern and resolute zeal equal to that of the early Romans themselves—after he had protected the weak empire from formidable invasion by his own kinsmen, administered its affairs with remarkable ability, moderation, and integrity, and restored the old heroic glory to the imperial arms. Three months after his death, Alaric and his Visigoths were at the gate of Rome.

STILL, a. *stīl* [Ger. *still*, still: Dan. *stille*; Sw. *stilla*; Dut. *stīl*, calm]: without sound; noiseless; quiet; silent; uttering no noise; motionless; in *OE.*, continual; constant: N. silence; calm: AD. to this time; always; continually; after that; even yet: V. to make motionless; to put a stop to, as noise, motion, etc.; to calm; to lull; to silence. STILL'ING, imp. STILLED, pp. *stīld*. STILL'NESS, n. *-nēs*, freedom from noise; in *OE.*, habitual silence; taciturnity.

STILL—STILLINGFLEET.

STIL'LY, a. -lĭ, quiet; calm: **AD.** silently. **STILL-BORN**, a. dead at birth; abortive. **STILL-LIFE**, the class or style of painting which represents vegetable life, objects no longer animate, as fruits, flowers, dead game, and the like; also vases and house-furniture. A **STANDSTILL**, absence of motion; checked progress.—**SYN.** of 'still, v.': to quiet; calm; pacify; appease; subdue; suppress; stop; check; restrain;—of 'still, a.': quiet; gentle; serene; inert; stagnant;—of 'still, ad.': nevertheless; notwithstanding; ever.

STILL, n. *stĭl* [*L. stillārĕ*, to drop—from *stilla*, a drop]: vessel or apparatus for distilling liquids: **V.** to distil. **STILL-ROOM**, apartment for distilling; room where liquors, preserves, and the like are kept.—A *still* consists of the copper boiler or *alembic* (see **DISTILLATION**), in which is the fermented liquor whose vapors are to be distilled; of the *neck* or *head*, a pipe which conveys the vapor generated in the boiler into the worm; and of the *worm*, a coiled metal tube, packed in a vessel called a *refrigeratory* fitted up in such a manner that the cold water which is poured in at the top comes in contact as extensively as possible with the outside of the tube and exercises a condensing action on the vapor which it contains. The vapor thus condensed in its passage through the worm, makes its exit in drops, or in a small stream, into a vessel called the *recipient*, and may be redistilled or not as required. The forms of stills are extremely numerous, almost each species of spirit having a form fitted to it; but all conform to the general description above.

STILLATITIOUS, a. *stĭl'lä-tĭsh'ūs* [*L. stillatitĭus*, dropping—from *stillo*, I drop]: falling in drops; drawn by a still.

STILL-BORN and **STILLNESS**: see under **STILL** 1.

STILLÉ, *stĭl'lā*, **CHARLES JANEWAY**, LL.D.: historian: b. Philadelphia 1819, Sep. 23. He graduated at Yale 1839, and was admitted to the bar. He was a member of the executive committee of the U. S. sanitary commission from its establishment in the beginning of the war of secession, and afterward wrote the history of the commission. He became prof. of history in the Univ. of Penn. 1866, and was provost of that univ. 1868–80. Besides numerous pamphlets on the history of the United States, S. is author of *Studies in Mediæval History*.

STILLINGFLEET, *stĭl'ĭng-flĕt*, **EDWARD**: bishop of Worcester: 1635, Apr. 17—1699, Mar. 28; b. Cranbourne, Dorsetshire, England. He attended the grammar school of his native place; and 1648 became a student at St. John's College, Cambridge; took his degree as master of arts; and 1653 obtained a fellowship. For some years he was a private family tutor; and 1657 was presented to the rectory of Sutton. In 1659, he published *Irenicum, or the Divine Right of Particular Forms of Church Government examined*, maintaining views more latitudinarian than could be pleasant to the high church party, which views he afterward saw reason to modify. His next book was *Origines Sacræ, or Rational Account of the Christian Faith, as to the Truth and Divine Authority of the Scriptures*: this

STILLING THE SEA—STILLWATER.

made his reputation, and is still esteemed as one of the masterly treatises on its subject. In 1664, appeared his *Rational Account of the Grounds of the Protestant Religion*, a defense of the Church of England from the charge of schism in its separation from Rome, which was received with great favor, and brought him preferment. In 1665, the Earl of Southampton presented him to the rectory of St. Andrews, Holborn; he was also appointed preacher at the Rolls Chapel, and lecturer at the Temple, and chaplain in ordinary to Charles II. In 1670, he became, by favor of the king, canon residentiary of St. Paul's Cathedral, and 1678, was made dean of the same. In the court of ecclesiastical commission, instituted by James II., S. declined to act; and after the revolution of 1688, he received, in final acknowledgement of his services to the Protestant cause, his appointment to the bishopric of Worcester. He died at Westminster, and was buried in Worcester Cathedral.

S.'s chief works, besides the above, were *Origines Britannicæ, or Antiquities of the British Churches*; and a bulky volume, *The Unreasonableness of Separation*, in reply to an attack from Howe and others. Throughout, he was almost constantly producing polemic treatises, on one hand against the adherents of the Church of Rome, and on the other against the Nonconformists. His collected works, 6 vols. folio, were pub. 1710; and 1735 a supplementary vol. of Miscellanies was issued by his son, the Rev. James S., Canon of Worcester. S., though keen and unsparing in conflict, yet by his unquestioned piety and honesty of intention commanded the respect even of his bitter opponents.

STILLING THE SEA: see OIL ON THE WAVES.

STILLMAN, *stil'man*, SAMUEL, D.D.: 1737, Feb. 27—1807, Mar. 12; b. Philadelphia: Bapt. minister. His family removing to Charleston, S. C., he was there educated, studied theol., and was ordained an evangelist. After service at Bordentown, N. J., 1761–63, he was pastor of the First Bapt. Church in Boston till his death, with high reputation for pulpit eloquence. In public affairs, such as schools and benevolent institutions, he was active; was a founder of Brown Univ. 1764; and member of the convention that devised the U. S. constitution 1787. Some of his many sermons and addresses were pub. in a vol. 1808.

STILLWATER: city, cap. of Washington co., Minn.; on Lake St. Croix, and on the Chicago Milwaukee and St. Paul, the St. Paul and Duluth, the Chicago St. Paul Minneapolis and Omaha, and the Chicago and Northwestern railroads; 18 m. e.n.e. of St. Paul, 25 m. e. of the Mississippi river. It is at the head of navigation of St. Croix river, which here broadens into a beautiful lake; and it has lumber interests in which more than \$3,000,000 capital is invested. It contains 18 churches, pub. libraries, substantial co. and municipal buildings, penitentiary, 14 public-school buildings, school property valued at \$179,500, 2

STILT—STIMULANTS.

national banks (cap. \$350,000) 2 savings banks, and 1 daily and 4 weekly publications. The principal trade is in lumber; other industries are iron-foundries and flour-mills. Pop. (1880) 9,055; (1890) 11,260; (1900) 12,318.

STILT, n. *stilt* [Ger. *stelze*; Dan. *stytte*; Norw. *styltra*; Sw. *stylta*; Dut. *stelt*, a stilt]: a pole of wood with a support or shoulder to raise the foot above the ground in walking, used in pairs: in *Scot.*, a crutch: V. to raise as on stilts; to raise by unnatural means. **STILT'ING**, imp. **STILT'ED**, pp.: **ADJ.** elevated as on stilts; pompous; bombastic; inflated. **STILT**, or **STILT-BIRD** (see **STILT** 2). **STILTS**, n. plu. the



Stilted Arch.

parts of the plow forming the two handles to be held by the plowman when plowing. **STILTED ARCH**, arch in which the impost molding is placed some distance below the springing of the arch.

STILT, miscalled **STILT PLOVER** (*Himantopus*): bird of the Avocet family (*Recurvirostridae*), of few species, including the White S. of the central belt of the old world, with back and wings greenish black. The U. S. species is *H. nigricollis*, 13-15 in. long, black glossed with green, with forehead, sides of the neck, rump, and under parts white; back also white, but so concealed by the scapular feathers as to appear black; slender bill, slightly recurved, 3 in. long; legs pale carmine-red and very long. It is known also as Longshanks, and Lawyer. The young and females have brown instead of black. The species reaches the coast of N. J. from the s. the last of Apr. in small flocks, and breeds in salt-marshes. The nests are slightly constructed at first, but, as common with marsh-birds, built higher and stronger during incubation. On alarm, the parent birds alight at a distance, and simulate weakness to invite pursuit away from the nest. They feed on the smaller aquatic animals, and their flesh is not much esteemed.—The **STILT SANDPIPER** (*Micropalama himantopus*), or Long-legged Sandpiper, 8-9 in. in length, bill $1\frac{1}{2}$ – $1\frac{3}{8}$, is of family *Scolopacidae*, and resembles in coloring the Red-breasted or Gray Snipe, but the tail quills are not barred: it is found in N. Amer. generally, but not common anywhere.

STILTON, n. *stil'tūn*: a white rich cheese first made at *Stilton* in Huntingdonshire, now made in Leicestershire, etc.

STIMULANTS: agents which suddenly but not permanently augment the activity of the vital functions. They give increased energy to the circulatory and cerebro-spinal nervous systems, the primary effect being probably on the nervous system, while the circulation is only secondarily affected. In their mode of action they resemble Tonics (q.v.) in some respects: thus immediately after their administration a feeling of increased power is produced, which, however, is not permanent, and is almost always followed by corresponding depression of vital power; their effects are, however, more immediate than those of tonics.

STIMULANTS.

Many of these agents, e.g., alcohol and the ethers, are closely allied to narcotics, their secondary effect, if given in sufficiently large doses, being to produce sleep, and even coma. — The following are the most important of the general stimulants. 1. *Alcohol*, in the various forms of spirits and wines. As a stimulant, alcohol is used in medicine to spur the vital powers in the advanced stages of fevers, particularly those of low or typhous character; and it is of service in flatulent colic, in some forms of indigestion, in vomiting, and in fainting. In anæmia or poverty of the blood, wine is temporarily useful at meals on account of its stimulating the appetite. The wasting effect of pulmonary disease may be much retarded and loss repaired by administration of a small quantity of whisky or brandy in cream after or before meals. Alcohol aggravates rheumatic and gouty affections. In all cases, it is but a whip or spur, to be used only in emergencies when other means are wanting, and with full knowledge that the reaction depresses the vital energies. In cases of severe uterine hemorrhage, it may be given in very large quantity. (Further, see *ALCOHOL—Uses*: and references there given.) 2. *Ammonia*, either in the form of *Solution of Ammonia*, or *Liquor Ammonia*, or as *Carbonate of Ammonia*, is a general stimulant, whose action is rapid, but temporary. It is of special use in the advanced stages of continued fever, in the eruptive fevers when the rash has receded (especially in scarlatina), and in later stages of pneumonia. It is the best internal stimulant to employ in profound intoxication, and in cases of poisoning by sedatives; and as an external stimulant, the vapor is inhaled in cases of fainting. The solution (not to be confounded with the *Strong Solution of Ammonia*) may be given in doses of 5 to 30 minims, diluted with two ounces of water, mucilage, or any bland fluid. The *Carbonate* (formerly known as the sesquicarbonate, which it really is) may be given in doses of 3 to 10 grains in pills or in cold water. The *Aromatic Spirit of Ammonia*, containing both ammonia and its carbonate, is an excellent and agreeable stimulant in fainting, hysteria, flatulent colic, etc., in doses of half a dram to a dram, taken in water, etc. 3. *Cajeput Oil*, in doses of 2 to 6 drops on a lump of sugar, or rubbed up with sugar, is a powerful diffusible stimulant, admirably suited for cases of flatulent distention of the stomach and intestines. 4. *Ether* (known also as *Sulphuric Ether*) acts as a general diffusible stimulant; but its effects, though rapid, are very transient. It is employed chiefly as a stimulant in spasmodic and nervous affections unaccompanied by inflammation, e.g., in cramp of the stomach, in spasmodic or flatulent colic, in nervous palpitations, in hiccup, in nervous headache, during a paroxysm of spasmodic asthma, in aphonia, etc. It frequently has good effect in advanced stages of fever, when the twitching of the muscles, known as *subsultus tendinum*, and hiccup are present; and as an immediate stimulant in fainting and asphyxia. (See Neligan's *Medicines*, etc., 6th ed., 452.) The usual dose is about a dram in some aromatic water. To these more

STIMULATE—STING RAY.

important stimulants may be added camphor, ginger, horse-radish, the preparations of lavender, of the mints, etc. Also, electricity, galvanism, and magnetic electricity operate on the animal system either as general or local stimulants, according to the manner in which they are applied: see ELECTRICITY, MEDICAL.

STIMULATE, v. *stím'ũ-lāt* [L. *stimŭlātus*, pricked with anything sharp, urged onward; *stimŭlārē*, to prick—from *stimŭlus*, a goad: F. *stimuler*]: to excite to action, or more vigorous exertion; to urge; to animate. STIM'ULATING, imp. STIM'ULATED, pp. STIM'ULANT, n. *-lānt* [F. *stimulant*—from L. *stimŭlans* or *stimŭlan'tem*, impelling, driving]: in *med.*, anything which produces a sudden though transient increase of vital energy and strength: ADJ. having the quality of increasing or exciting vital action. STIM'ULANTS, n. plu. *-lānts*, familiarly, intoxicating liquors: in *med.* (see below). STIM'ULATOR, n. *-tēr*, one who stimulates. STIM'ULA'TION, n. *-lā'shŭn*, act of stimulating or exciting; the effect produced. STIM'ULATIVE, a. *-lā-tīv*, exciting to action: N. that which excites or rouses to action. STIM'ULOSE, a. *-lōz*, in *bot.*, covered with stings. STIM'ULUS, n. *-lŭs* [L. *stimŭlus*, a goad]: in *med.*, that which produces a sudden but transitory increase of vital action (see STIMULANTS): anything that excites to action; in *bot.*, a stinging hair.—SYN. of 'stimulate': to incite; encourage; impel; instigate; irritate; exasperate; incense; rouse; awaken.

STING, n. *stĭng* [Icel. and Sw. *stinga*; Dan. *stinge*; OHG. *stingan*, to stick, to thrust: Goth. *stiggan*, to sting]: the sharp-pointed weapon possessed by certain insects as a means of defense, as the wasp, the bee, etc.; anything that gives acute pain; the thrust of a sting; that which constitutes the principal pain or terror; the point of an epigram; in *bot.*, one of the sharp stiff hairs with which many plants are supplied: V. to pierce with a sharp-pointed weapon; to pain acutely, as by the conscience. STING'ING, imp.: ADJ. pungent as a sting; paining acutely. STANG, pt. *stāng*. STUNG, pp. *stŭng*. STING'INGLY, ad. *-lĭ*. STING-LIKE, a. like a sting. STING'LESS, a. *-lēs*, having no sting; harmless. STING'ER, n. *-ēr*, one who or that which stings.

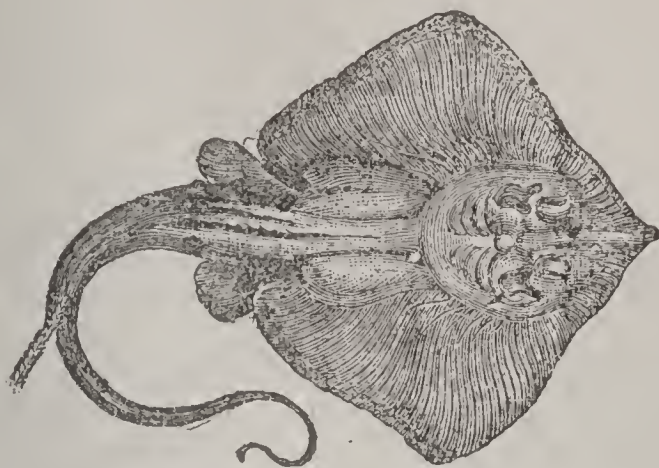
STING'-FISH: see WEEVER.

STINGO, n. *stĭng'gō* [from its *stinging* or stimulating qualities]: the strong old ale of Yorkshire; any strong good drink.

STING RAY (*Trygon*): genus of cartilaginous fishes, of order *Raiæ* (see RAY), family *Trygonidæ*. In this family, the tail is long and slender, the eyes on the upper (dorsal) aspect, and in the genus *Trygon* the tail is armed with a strong spine notched on both sides. The tail has either no fin, or one merely rudimental. The S. R. is dreaded from its use of its muscular and flexible tail as a weapon, twisting it round the object of attack, and inflicting severe lacerated wounds with the serrated spine: these wounds often cause great inflammation, whence a notion has been prevalent from ancient times that the sting is charged with

STINGY—STINK.

venom; but of this there is no evidence. For the N. Amer. S. R., see RAY.—Various species are plentiful in warm seas, and they are everywhere dreaded. The spine is used by the savages of the South Sea Islands to point their spears.



Sting Ray (*Trygon pastinaca*).

STINGY, a. *stīn'jī* [prov. Eng. *skingy*, cold, nipping; *schinch*, a small bit: F. *chiche*, pinching, niggardly: comp. Gael. *sanntach*, avaricious]: niggardly; sordid; narrow-spirited; penurious. **STIN'GILY**, ad. *-lī*. **STIN'GINESS**, n. *-nēs*, the state or quality of being stingy; extreme avarice. *Note*.—According to Skeat, *stingy* is merely an adj. formed from **STING**, and means (1) stinging, keen, (2) churlish.

STINK, n. *stīngk* [OHG. *stinchan*, to smell sweet or the opposite: Ger. and Dut. *stinken*; Dan. *stinke*, to stink]: strong offensive smell: V. to emit a strong offensive smell. **STINK'ING**, imp.: ADJ. emitting a strong offensive smell. **STUNK**, pt. *stūngk*, or **STANK**, pt. *stāngk*. **STUNK**, pp. *stūngk*. **STINK-POT**, in *warfare*, especially Chinese, etc., shell or jar, often of earthenware, charged with combustibles, which, on bursting, emit a foul smell and a suffocating smoke. It is used in sieges for driving the garrison from their defenses; also in boarding a ship, for effecting a diversion while the assailants gain the deck. Under the more elegant title *Asphyxiated Shell*, modern nations have experimented considerably on this mode of harassing an enemy. **STINK'STONE** [Ger. *stinkstein*], or **SWINE'STONE**, kind of marble or limestone, usually of dark color, remarkable for the fetid urinous odor which it emits when sharply struck or rubbed: it contains a little sulphur. **STINKARD**, n. *stīngk'ērd*, mean paltry fellow: animal producing a strong fetid odor, found in Java and Sumatra. **STINK-TRAP** (see **STENCH-TRAP**). **STINK-WOOD** (*Oreodaphne foetida*), tree of nat. order *Lauraceæ*, native of the Cape of Good Hope, remarkable for the strong disagreeable smell of its wood: the wood, however, is hard, very durable, takes excellent polish, and resembles walnut. It has been used in ship-building.

STINT—STIPULATE.

STINT, n. *stǫnt* [Icel. *stuttr*; O.Sw. *stunt*, short: Ger. *stutz*, anything cropped or docked: Icel. *styttu*, to shorten]: limit; bound; proportion; quantity assigned: V. to restrain within certain limits; to limit to a certain quantity; to bound; to restrain; in *OE.*, to cease; to leave off. **STINT'ING**, imp. **STINT'ED**, pp.: **ADJ.** limited; bounded; checked in growth. **STINT'ER**, n. *-ér*, one who stints. **STINT'LESS**, a. *-lēs*, unlimited. **STINT'EDNESS**, n. *-nēs*, the state of being stinted.

STINT': see **SANDPIPER**.

STIPA: see **FEATHER GRASS**.

STIPATE, a. *stī'pāt* [L. *stīpātus*, pp. of *stīpārē*, to crowd or press together]: in *bot.*, pressed together; crowded. **STIPATION**, n. *stī-pā'shūn*, an accumulation in the cavities or tissues.

STIPE, n. *stīp* [L. *stīpēs*, a stock, a stalk: It. *stipite*, the stalk or stem of a plant]: in *bot.*, the stem of palms and tree-ferns; the stalk of fern-fronds. **STIPEL**, n. *stī'pèl*, a small leaflet at the base of the pinnules of compound leaves.

STIPEND, n. *stī'pěnd* [L. *stīpendīum*, a tax, a contribution—from *stīps*, a contribution in small coin; *pendo*, I weigh or pay]: settled pay for services; salary—term applied to clerical incomes: in the Presb. Church of Scotland, the salary for support of a parochial clergyman—payable at Whitsunday and Michaelmas: see **TEINDS**: **AUGMENTATION**, **PROCESS OF**. **STIPENDIARY**, a. *stī-pěnd'ī-ér-ī*, performing services for stated wages or salary, as a *stipendiary* magistrate: N. one who receives stated salary for services; a paid magistrate. **STIPENDLESS**, a. *-lēs*, without a stipend.—**SYN.** of 'stipend': wages; allowance; income; pay; payment.

STIPITATE, a. *stīp'ī-tāt* [L. *stīpēs* or *stīpitem*, a stalk]: in *bot.*, supported on a stalk which is neither a petiole nor a peduncle. **STIPITIFORM**, a. *stī-pīt'ī-fawrm* [L. *forma*, shape]: resembling a stalk or stem.

STIPPLE, v. *stīp'pl* [Dut. *stippelen*, to speckle, to dot—from *stippel*, a speckle]: to engrave by means of dots, instead of, as in the ordinary method, by lines. **STIP'PLING**, imp. *-pling*. **STIPPLE**, or **STIPLING**, n. a mode of engraving by dots, in imitation of chalk-drawings. **STIPPLED**, pp. *stīp'pld*: **ADJ.** worked in stippling.

STIPULATE, v. *stīp'ū-lāt* [L. *stīpulātus*, bargained, covenanted; *stīpulāri*, to bargain—from old L. *stīpūlus*, firm, strong: It. *stipulare*: F. *stipuler*]: to make an agreement with any one; to settle terms; to bargain. **STIP'ULATING**, imp. **STIP'ULATED**, pp. agreed; contracted. **STIP'ULATOR**, n. *-tér*, one who stipulates. **STIP'ULA'TION**, n. *-lā'shūn* [F.—L.]: contract; agreement or bargain: in *Roman law*, an agreement attended with certain solemnities.—**SYN.** of 'stipulation': covenant; bargain; engagement; condition.

STIPULE—STIRLING.

STIPULE, n. *stīp'ūl* [F. *stipule*—from L. *stipŭla*, a stem, a stalk: It. *stipula*]; in *bot.*, a modified leaflet at the base of another leaf; leafy appendage at the base of the leaf-stalk in many plants. Sometimes the S. is solitary, but frequently there are two, one on each side of the leaf-stalk. They are of very various form and character, often very dissimilar to the leaf with which they are connected. In some plants they are large, enveloping the young leaf, but soon falling off; in many they are deciduous; but in many they are permanent as the leaf itself. Their presence or absence, their deciduous or persistent character, and other peculiarities, form distinctive characteristics not only of species and genera, but of natural orders. They are generally green,



like leaves; but sometimes membranaceous. In *Stipules*, s, s. some plants they assume the form of spines; in *Cucurbitaceæ*, that of tendrils. Organs of the same nature with stipules appear at the base of the leaflets of some compound leaves. **STIP'ULA'CEOUS**, a. -*ŭ-lŭ shŭs*, consisting of or resembling stipules; growing on stipules, or close to them **STIP'ULAR**, a. -*lŕ* resembling a stipule. **STIP'ULARY**, a. -*ŭ*, in *bot.*, applied to organs occupying the place of stipules, such as tendrils. **STIP'ULATE**, a. -*lŭt*, furnished with stipules. **STIP'ULED**, a. -*ŭld*, furnished with stipules or leafy appendages.

STIR, v. *stŕ* [AS. *styrĭan*, to move, to stir: Icel. *stýrr*, a stir, disturbance: Ger. *stören*, to disturb: Dut. *storen*, to vex]: to move; to put into motion; to agitate; to incite; to rouse; to stimulate; to move one's self; to bring into discussion or notice: N. tumult; bustle; public disturbance or disorder; agitation. **STIR'RING**, imp.: **ADJ.** putting in motion; busy and active; exciting, as a speech: N. the act of stirring or moving. **STIRRED**, pp. *stŕd*. **STIR'NER**, n. -*rŕ*, one who or that which stirs. **STIR'ABOUT**, n. -*ŭ-bowt*, a dish of oatmeal stirred among cold milk or water; oatmeal porridge; also known in *Scot.* as *crowdy*. **TO STIR UP**, to inflame the passions of; to put into motion or action; to enliven.—**SYN.** of 'stir, v.': to incite; move; arouse; animate; excite; provoke; quicken; instigate; raise.

STIRK, n. *stŕk* [Ger. *stier*, a bull: AS. *styrĭc*, a heifer: Gael. *stuir*, a male calf: see **STEER** 3]: in *Scot.* and *prov. Eng.*, a young bull, ox, or heifer.

STIRLING, *stŕ'ling*: market-town, river-port, and royal parliamentary, and municipal burgh, cap. of the county of Stirlingshire; on the s. bank of the Forth, 36 m. w.n.w. of Edinburgh, 29 m. n.n.e. of Glasgow by railway. Like Edinburgh, which it resembles in its main features, it owes its origin doubtless to the strong natural fortress of its Castle Hill. From this hill, covering the declivity which slopes n. and e. to the plain, extends the oldest part of the town, around which are numerous streets; while many villas have arisen in the environs. The Castle Hill, which rises gradually from the e., and fronts the w. with a steep,

STIRLING.

precipitous wall of basaltic rock, overlooks the beautiful and fertile *carse* or flat along the banks of the Forth. Among the more prominent public buildings and institutions are the East and West Churches—the former erected by James IV. about 1494; and ‘Mar’s Work,’ an incomplete structure, richly ornamented, built by the Earl of Mar, Regent of Scotland, who died 1572. In the more ancient quarters, one or two pleasing specimens of old Scotch domestic architecture remain: of these, ‘Argyle’s Lodging,’ with its pinnacled round towers and decorated windows, is the chief: it is now a military hospital. The town-house is surmounted with a spire, and has the old jail attached. It contains the jug or standard of dry measure which was given to the keeping of the town by the Scottish parliament; while Linlithgow is said to have received the firloft; Edinburgh, the ell, etc. Cowan’s Hospital, founded 1639, is an object of interest. There are also an athênæum, corn exchange, and numerous excellent schools. A magnificent art institute, Smith Institute was opened 1874.

The importance of S. in early times was due to its situation and its defenses. At the head of the navigation of the Forth, when there were no regular ferries, S. was the key to the Highlands, and the possession of it and its means of n. and s. communication was of great importance. The town, besides, was strongly fortified both by nature and by art. The ancient bridge of S., whose age is unknown, but which was in existence 1571, is of four arches, and was defended at each end by gates and towers. This bridge was, until recent times, the only one by which wheeled carriages could cross the Forth. Vessels of 150 tons can reach the port of S.; but its commerce by river is now less important than before the days of railways. The rich agricultural, mining, and manufacturing districts around give the town a basis of prosperity. Manufactures of ropes, malt, leather, soap, and mineral oils are carried on. Pop. royal burgh (1881) 16,013; (1891) 16,895.

S. (formerly *Stryvelyne*, or *Estrivelin*) is one of the most ancient and historically important towns of Scotland. It is of unknown antiquity; and there is no record from which the date of the foundation of even the castle can be determined. Its rock must have been the site of a frontier fortress from the earliest times. The place soon became the most important fortress in Scotland, and the centre of the long struggle between England and Scotland. Alexander I. died in the castle 1124. In the vicinity the battle of S. was fought 1297 (see WALLACE). The town was taken by Edward I., after a siege of three months, 1304. The famous battle of Bannockburn (q.v.) occurred in this vicinity 1314. The castle was the birthplace of James II. and of James V. James III. built the parliament house in the castle, and otherwise improved and embellished the fortress. James V. built the palace, the walls of which are profuse in grotesque ornamentation. In the older part of the castle is the ‘Douglas Room,’ in which William, Earl of Douglas, was assassinated by James II. In 1651, after the battle of Dunbar, the castle was taken by Monk; and

STIRLING—STIRLINGSHIRE.

it withstood a siege by the Highlanders 1745. The views from the towers of S. castle is unsurpassed in beauty. Westward, the rich vale of Menteith stretches away to the Highlands, where Ben Lomond, Ben Venue, Ben A'an, and Ben Ledi close the scene. The glittering 'links' of Forth are seen in the Carse of Stirling, surrounded by fertile fields and luxuriant woods; the Abbey Craig, crowned by the Wallace Monument, rises boldly on the n.; while on the e. are seen the picturesque ruins of Cambuskenneth Abbey.

STIR'LING, Earl of (or LORD STIRLING): name commonly applied to WILLIAM ALEXANDER, maj.gen. in the Amer. revolution: 1726-1783, Jan. 15; b. New York. Like his father, James A. S., he was highly educated and addicted to science. After the French and Indian war, in which he held commissions, he spent much of his wealth in England in a fruitless suit to establish his claim to the title and estates of Stirling. Returning to New York, he was surveyor-gen. and a member of the provincial council. Appointed col. 1775, he made a daring expedition that captured a supply ship of the enemy. He was appointed brig.gen. 1776. In the battle of Long Island, he was first and last, exhibiting great intrepidity, and was captured after making good the retreat of his troops. Exchanged, he was made maj.gen., and fought at the Brandywine, Germantown, and Monmouth. He was active in exposing Gen. Conway's conspiracy against Washington. After the war he was influential in founding King's (now Columbia) Coll., and the N. Y. Society library.

STIR'LING, Sir THOMAS: British soldier: 1735-1808, May 9; b. Scotland. He was capt. of the royal highland regt. which engaged in the Lake George and Lake Champlain expeditions against the French 1758-9, aided in the siege of Niagara, went with Gen. Amherst to Montreal; was afterward stationed at Fort Chartres, Ill., and at Philadelphia; and took part in many battles of the revolution—among them that on Staten Island, that of the Brandywine and of Springfield, N. J. He was promoted maj.gen. 1782, lieut.gen. 1796, and gen. 1801. He was made a baronet 1796.

STIR'LINGSHIRE, -shér: county in Scotland, the borderland between the Highlands and Lowlands; of very irregular outline, bounded n. by Perthshire, and by the river and Firth of Forth; extreme length n.w. to s.e. 45 m., extreme width n. to s. about 18 m.; 467 sq. m. A considerable part of S. is occupied by the carses of Stirling and Falkirk, formerly covered for the most part with unproductive moss. On the removal of the moss-soil, part of which was floated off into the Forth by the agency of running water, a rich clay-soil, of various depths, from a plow-furrow to 20 and even 30 ft was reached, and is now cultivated with marked success. The chief rivers are the Forth (q.v.), the Carron—navigable for small vessels to Carron-shore—and the Endrick. Loch Lomond (q.v.) is the only important lake in the county. N.e. from it a spur extends from the Grampian Hills, whose chief eleva-

STIRRUP—STITCHWORT.

tion is Ben Lomond (q.v.). The Lennox Hills (highest 1,894 ft.), in the centre of the county, occupy about a fourth of its area. S. is remarkable for minerals, especially iron-stone, wrought extensively at Carron (q.v.). A coal field extends along the s.e. Woollen goods, etc. are largely manufactured, especially at Alva, Bannockburn, and in the neighborhood of Stirling (q.v.). Of the area of 298,579 acres, there were (1881) 114,191 acres under all kinds of crops, bare fallow, and grass. There were 30,992 under grain crops (2,811 in wheat); under green crops, 9,998 (4,658 in turnips); 23,663 under clover and grasses under rotation; 48,101 under permanent pasture and meadow; only 12,483 under forest. Pop. (1881) 112,443; (1901) 142,291.

STIRRUP, n. *stēr'rûp* or *stîr'* [AS. *stirap*; Ger. *stegreif*, a rope or strap for mounting on horseback—from AS. *stigan*; Ger. *steigen*, to mount, and AS. *rap*; Ger. *reif*, a rope; Gael. *streap*, to climb]: the foot-iron suspended from a saddle; among *seamen*, a rope secured to a yard having a thimble at its lower end, and supporting portions of the tackle for managing the sails. **STIRRUP-CUP**, a parting cup taken on horseback. **STIRRUP-LEATHER** or **-STRAP**, the strap that supports a stirrup.

STITCH, n. *stîch* [a modification of Eng. *stick*, a thrust with a sharp instr.: Ger. *sticken*, to embroider; Dan. *stikke*, to stick, to stitch]: a single loop or link; a single pass of a needle in sewing: sudden, sharp, shooting, local pain, as in the side (see below): V. to pass a needle with a thread through a piece of cloth and back again; to sew or unite with needle and thread; to practice sewing. **STITCH'ING**, imp.: N. work done by sewing. **STITCHED**, pp. *sticht*, sewed together. **STITCH'ER**, n. *-ēr*, one who or that which stitches. **STITCH'ERY**, n. *-ēr-î*, in *OE.*, needlework, in contempt. To **STITCH UP**, to mend what was rent.

STITCH, *stîch*, in the Side: popular name for the pain felt in pleurisy. It occupies a point or small spot on a level with, or just beneath the breast on the affected side; and patients state that they feel as if some sharp stabbing instrument were being driven in at that spot, whenever the act of inspiration goes beyond a certain limit (see **PLEURISY**).—A simple modification of stitch is frequently caused by exercise soon after a full meal—the pain being lower in the side, and usually removed by stooping: hence the popular remedy for this pain is to mark with the finger a cross upon the foot.

STITCH'WORT (*Stellaria*): genus of plants of nat. order *Caryophyllæ*, having a calyx of 5 leaves, 5 deeply-cloven petals, 10 stamens, 3 styles, and a many-seeded capsule opening with six teeth. The species are numerous—annual and perennial plants, with weak stems and white flowers, which in some are minute, and in others large enough to be ornamental to woods and hedge-banks, as in the Wood S. (*S. nemorum*) and the Greater S. (*S. Holostea*). To this genus the common Chickweed (q.v.) is now generally referred.

STITH—STOCK.

STITH, *stīth*, **WILLIAM**: historian: 1689–1755; b. Va.; brother-in law of Peyton Randolph, and nephew of Sir John Randolph. After Episc. ordination in England, he was head of the grammar school of the Coll. of William and Mary; chaplain of the Va. house of burgesses 1738; rector of Henrico parish and pres. of William and Mary Coll. 1752–55. He pub. a painstaking hist. of Va. from its settlement to 1747, founded on valuable documents since lost by fire. An ed. restricted to 250 copies was reprinted 1866. He pub. also *The Nature and Extent of Christ's Redemption* (1753).

STITHE, or **STITH**, or **STYTH**, a. *stīth* [AS. *stīth*, severe, hard]: in *Scot.* and *OE.*, steady; strong; hard; severe.

STITHY, n. *stīth'ī* [Icel. *stethi*; Sw. *städ*, an anvil]: an anvil; a smith's workshop. **STITH**, or **STITHE**, n. *stīth*, in *OE.*, an anvil.

STIVER, n. *stī'vēr* [Dut. *stuiver*]: Dutch penny-piece, one-twentieth of a guilder (value about 2 cents); hence, anything mean or worthless. See **GUILDER**: **FLORIN**.

STOAT, n. *stōt* [from a supposed analogy to a stallion-horse: AS. *stodhors*, a stallion or stud horse]: a weasel or ermine: see **ERMINE**.

STOB, n. *stōb* [a form of **STAB**]: in *Scot.* and *OE.*, a splinter of wood; a pointed stake of wood for driving into the ground; an awl.

STOCCADO, n. *stōk-kā'dō* [Sp. *estocada*, a thrust: Ger. *stock*, a stick]: in *OE.*, a thrust with a rapier in fencing.

STOCK, n. *stōk* [AS. *stoc*, the stock of a tree: Gael. *stoc*, a trunk: Ger. *stock*, a stick, stump of a tree: Icel. *stokkr*; Sw. *stock*, trunk, log]: stem or trunk of a tree or plant; stem or branch in which a graft is inserted; anything fixed or set; a post; a log; a piece of solid wood forming the sustaining part, as of an anchor or a firearm; the handle of anything: a stupid senseless person: the original progenitor; the race or line of a family: stiff band used as a tie for the neck: in *Scrip.*, an idol. **STOCKS**, n. plu. wooden frame with openings into which the legs of a person may be *stocked* or set fast, formerly used as a temporary punishment for petty crimes and misdemeanors (see below): certain flowers having stems or stalks: the timbers on which a ship rests while building. **STOCK'ISH**, a. in *OE.*, hard; like a block of wood; stupidly inert. **STOCK-DOVE**, the wild pigeon of Europe (see below). (**STOCK-STILL**, a. motionless, as if a stock or log. **STOCK-LOCK**, a lock in a wooden case or frame. **ON THE STOCKS**, not yet finished, referring to the supports of an unfinished ship in a building-yard.—**SYN.** of 'stock': post; body; race; lineage; family.

STOCK.

STOCK, n. *stōk* [from Stock 1, the primary notion of 'something permanent' being also here evident]: money or goods employed in trade, manufacturing, banking, etc.; the beasts, etc., on a farm; the money collectively lent by individuals to a government or public company; the public funds (see **FUND**); government scrip: supply provided; quantity on hand; store or accumulation from which supplies may be obtained: in *cooking*, the broth or boiled meat, etc., before it is converted into sauces, soups, etc.: **ADJ.** serviceable for constant use or application, as a *stock* sermon; permanent; standing: **V.** to store; to supply; to fill sufficiently. **STOCK'ING**, imp. **STOCKED**, pp. *stōkt*. **STOCK-BROKER**, one employed in buying and selling for others stock in the public funds, or the stocks of joint-*stock* companies. In most principal cities stock exchanges are established, and the stock or share brokers are members of such exchanges, and are bound to transact business under their rules. **STOCK-EXCHANGE**, building where stocks are bought and sold; association or company of stock-brokers (see below). **STOCK-FARMER**, farmer who attends chiefly to breeding and rearing of live-stock, as cattle, sheep, etc. **STOCK**, flower (see below). **STOCKHOLDER**, a proprietor of stock in the funds, or of shares in a public company. **STOCK-JOBBER**, a dealer or middleman in the sale or purchase of *stocks* or *shares*; a gambler in stocks. **STOCK-JOB-BING**, art or practice of dealing in stocks. **STOCKMAN**, in *Australia*, one in charge of the live-stock; a herdsman. **STOCK-TAKING**, periodical making of an inventory of the quantity and cost-value of the goods on hand, and of fixtures and tools—by a merchant or tradesman. **STOCK-IN-TRADE**, goods kept for sale by a merchant, trader, or shop-keeper; the fittings and appliances of a workman. **DEAD STOCK**, goods for which a market cannot be found: in *agri.*, the implements of husbandry and stored-up field-produce, as distinguished from **LIVE-STOCK**, the domestic animals kept and reared on a farm. **TO STOCK AN ANCHOR**, to fit it with a stock. **TO STOCK DOWN**, to sow, as plowed land with grass-seeds.—**SYN.** of 'stock, n.': capital; principal; store; fund; accumulation; hoard; supply; provision; cattle.

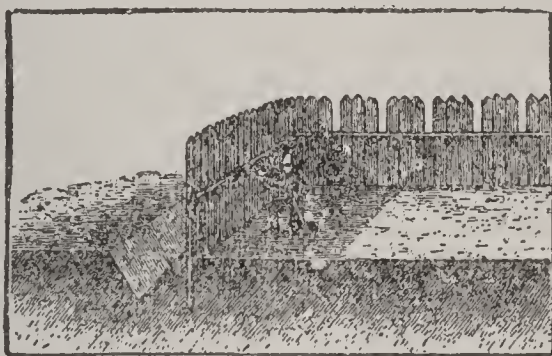
STOCK, n. *stōk*: OE. for **STOCCADO**, which see.

STOCK, or **STOCK GILL'LYFLOWER** (*Matthiola*): genus of plants of nat. order *Cruciferae*, having cylindrical or compressed pods, and a stigma consisting of two upright appressed plates, the outer side of which often rises into a knob or horn. The species are herbaceous or half shrubby, natives of countries around the Mediterranean Sea; most of them thickly clothed with white or grayish stellate hairs; the flowers in racemes, and generally beautiful and fragrant. Some of the species have long been much cultivated, and many fine varieties have been produced by cultivation. *M. incana* is probably the parent of the greater number of the cultivated kinds with hoary leaves, known as Brompton S., etc.; while those with smooth leaves, called Ten-week S., German S., etc., are referred to *M. annua*, *M. glabra*, and *M. fenestralis*, perhaps mere varieties of one

STOCKADE—STOCKBRIDGE.

species. Some sandy shores produce a species, *M. sinuata*, whose large purple flowers are fragrant only at night—a characteristic of several other species. Stocks are raised by gardeners always from seed, which even the double kinds often produce, a multiplication of the petals having taken place without loss of the parts of fructification. Of the seedlings, however, some produce double, others single flowers, so that only some gratify the cultivator. The hoary-leaved stocks are generally treated as biennials, though, in reality, they may almost be reckoned perennial; and it is not desirable that they should flower the first year, as the plants become stronger when they remain without flowering till the second year, and produce richer racemes of flowers. The smooth-leaved stocks are treated as annuals.—The beautiful little annual, Virginian Stock (*Malcolmia maritima*) does not belong to this genus, though of the same nat. order: it is a native of the shores of the Mediterranean, and has become a great favorite, almost rivaling mignonette.

STOCKADE, n. *stōk-ād'* [from Eng. *stock*: F. *estocade*, a thrust or stab into: It. *stoccata*, a thrust in fencing]: a line of strong stakes or posts fixed in the ground as a barrier



Stockade.

to the advance of an enemy; an inclosure made with posts: V. to fortify with strong posts fixed in the ground. STOCK-A'DING, imp.: N. a line of strong posts stuck upright in the ground. STOCKA'DED, pp.

STOCKBRIDGE, *stōk'brīj*: a town in Berkshire co., Mass.; on the Housatonic river and the Housatonic railroad; 8 m. n. of Great Barrington, 17 m. s.-by-w. of Pittsfield; 93 m. n. of Bridgeport. It is beautifully located amid picturesque mountain scenery and in the vicinity of Lake Mahkeenac and Monument Mountain; is a charming summer home and tourists' resort; and was the tribal home of the Housatonic (known also as Stockbridge) Indians. It contains 4 churches, public library, 1 national bank (cap. \$200,000), public park, monument to Jonathan Edwards (q.v.), and several schools. The park, library, and one of the churches were joint gifts of the Field brothers, Cyrus West, David Dudley, Henry Martyn, and Stephen Johnson, the church being a memorial to their parents—their father having been long the pastor of the Congl. Church in S.—Pop. (1890) 2,132; (1900) 2,081.

STOCKBRIDGE—STOCK-EXCHANGE.

STOCK'BRIDGE, HENRY: lawyer: b. North Hadley, Mass., 1822, Aug. 31. He graduated at Amherst Coll. 1845, studied law, and settled in Baltimore, Md., for the practice of his profession. He was special U. S. dist. attorney at Baltimore on behalf of the war dept. during the civil war. Elected to the state legislature 1864, he draughted the law calling a constitutional convention for abolition of slavery in Md., and was an influential member of that convention. Later, he prosecuted in the courts slave-owners who sought to circumvent the emancipation clause by means of indentures of apprenticeship. He was judge of the circuit court for Baltimore co. 1865. He is author of *The Archives of Maryland*, pub. 1886 by the Md. Historical Soc., of which he was a member. D. 1895, Mar. 11.

STOCK'BRIDGE, LEVI: agriculturist: b. North Hadley, Mass., 1820, Mar. 13. He was a successful farmer; and has been prominently connected with the Massachusetts Agricultural College from its organization, being prof. of agriculture 1867-83, acting pres. 1876-79, pres. 1880-82, and retired as prof. emeritus. He has made important investigations regarding the circulation of sap in trees; evaporation, percolation, and deposition of dew; and originated the famous chemical fertilizers which bear his name. He served as justice of the peace 36 years, has long been prominent in town affairs, was a member of the Mass. board of agriculture 12 years, for 24 years has been chairman of the state board of cattle commissioners, which office he still (1891, Dec.) holds, was chosen presidential elector 1868, and has been four times elected to the lower house and twice to the upper house of the state legislature. He has contributed various articles to the *Encyclopædia Britannica Supplement*, and has lectured in most of the n. states on subjects connected with scientific agriculture.

STOCK'-DOVE (*Columba ænas*): the wild Wood Pigeon of Europe; called Stock either from nesting in the stocks of trees, or because it was supposed to be the original stock (now regarded as the Rock Pigeon, *C. livia*) of the domestic breeds. It is not the Ring-dove or Cushat, to which its name is sometimes applied (see PIGEON), but smaller, without the white neck-ring, and more confined to woody regions; otherwise it is similar. From the Rock Pigeon it differs in having black in spots instead of bars on the wings. It has not been domesticated, not breeding in confinement.

STOCK-EXCHANGE: organization of persons, and their place of meeting, for the business of selling or buying such stocks as have been recognized or listed for such dealing. English usage limits the term stocks to government stocks, annuities, etc.; while the term shares denotes the stock of railroads, banks, etc. In American usage a great variety of bonds and shares all are included under stocks, and are subject to S.-E. transactions when they have been placed on the S.-E. list, or 'listed.' Bonds representing national, state, county, and city engagements to pay debts, and the bonds or shares of railroads, banks, mining, manufacturing, telegraph, telephone, insurance,

STOCK-EXCHANGE.

etc., companies, are dealt in as stocks, if they are important enough to be listed. Two kinds of sales of stocks are made: that of the exchange in a regular way and for *bona fide* sale; and that of the street outside, called jobbing, and generally speculative, for mere betting on what prices will be. The form for the first is by a call of the list of the stocks. This is made twice a day, and these two calls mark what are known as the first board and the second board. The govt., state, and railroad bonds are called in a room specially allotted to that purpose. But in practice the sales are made outside these formal calls—brokers crying out what and how many shares they offer, and at what price, or what they want to buy, and at what price. These cries appear to make indescribable confusion to the unaccustomed ear, yet are readily distinguished and understood by those engaged, and transactions closed and noted accurately. Persons appointed for the purpose take record of these sales, and furnish a report, which is sent in all directions, for public information, or to offices where buying and selling of stocks is privately conducted. The record is made with free use of abbreviations: in the case of bonds, c. means coupon, r. registered, and o.b. delivery at the opening of the books of transfer. 'L. S. 400 : 125 : s. 60' means 400 shares of Lake Shore and Michigan Southern railroad stock at \$125, to be delivered at the seller's option any time within 60 days; but if recorded 'b. 60,' the option is with the buyer.

Stock is bought and sold not only outright, with payment in full, but also without intent to deliver, on what is called a margin, the object being to speculate in its future value. The buyer puts down 10 per cent. of the par value of the stock, and awaits the turn of the market. If this is downward, the buyer's broker either sells, if the fall goes so low as to be under the buyer's margin, or calls for more margin. If it is upward, the buyer sells at a favorable time, and pockets the amount realized by the rise, also recovering his 10 per cent. The broker's commission for selling or buying stocks is $\frac{1}{8}$ of 1 per cent. to all persons not members of the exchange, called also the brokers' board. Members pay \$2 per hundred shares. To contract to deliver stock at a future day, expecting meanwhile to buy at a reduced price, is called selling 'short;' and those who do this, and thus desire a fall of values, and try presumably to secure fall or shrinkage by efforts to depress or squeeze smaller holders, are called 'bears.' Those are termed 'bulls' who have bought for a rise of price, and wish to toss prices upward: they are said to be 'long' of the stock. To sell a 'put' is to agree to buy a certain number of shares of a particular stock, at a certain price, within a stated time, provided the buyer of the put and seller of the stock is prepared to deliver it at the time and price named. To sell a 'call' is to agree to deliver in the same way. The parties agree on the cost of these 'stock privileges,' as they are called, according to the time involved, the condition of the market, etc.

The London S. E. was organized 1773; and its building

STOCK-FISH—STOCKHOLM.

was erected 1801, on the basis of 400 shares of £50 each, the shareholders standing as members, and other brokers as subscribers. The number of these had reached about 1,000 in 1854, when £16,000 were spent on an extension of premises. A further extensive enlargement was made 1885, when the number had risen to above 2,500. The income is about £130,000 per annum, and the property is immensely valuable.

In the United States, Philadelphia had the earliest S.-E. That of New York was organized 1817. It has now 1,100 members, and a handsome building on Broad and New streets, with a great hall for doing business, and vaults for storing securities said to be the best ever constructed. A seat costs (1891) about \$25,000, but as much as \$34,000 has been paid. More than 250,000 shares of stock change hands in a single day. On the death of a member, his seat is sold for the benefit of his heirs, less his unpaid dues; and if he dies in good standing, \$10,000 in addition is paid them from a gratuity fund maintained by assessing each member \$10 on the occasion of a death. The rules of the S. E. are very strict; a high standard of integrity is maintained; and all disputes are settled by a committee of arbitration.

STOCK'-FISH: commercial name of salted and dried cod and other fish of the same family, particularly the Ling, Hake, Haddock, and Torsk or Cusk (see these titles). The fish is cured as soon as possible after being caught. Properly, S.-F. is fish dried in air without salting; but it is commonly used to denote all fish of the cod kind, split, salted, and dried. The cod, hake, or other fish is split from head to tail; cleansed from all particles of blood by plentiful washings with salt water; a piece of the backbone is cut away; and after the superfluous water has drained off, the fish are laid in long vats, covered with salt, and kept down by heavy weights. After a time, they are taken out, washed, brushed, and then exposed to sun and air on a sandy beach or on rocks. They are then gathered into little heaps, and when they assume a fine whitish appearance, known as the *bloom*, they are considered ready for market.

STOCKHOLM, *stök'hölm*: city, cap. of Sweden, at the e. extremity of the beautiful Mælar Lake (q.v.), 59° 20' n. lat., 18° 5' e. long. S. is one of the most beautiful capitals in Europe: it is built partly on the continent, and partly on nine holms or islands in the channel through which the Mælar Lake discharges its waters into the Baltic—the difference of level being about 6 ft. Numerous islands stud the sea in front of the city. The Helge-aand, Stads, and Riddar holms, which formed the nucleus of the ancient city, founded 1250 by Birgir Jarl, contain some of the finest public and private buildings, among which is the royal palace, built 1753, in the Italian style, on a hill commanding a view of the romantic shores of the lake. Near the palace, which possesses good antiquarian, numismatic, and other collections, a library, gallery of paintings, large gardens, etc., is the colossal statue of Gustavus

STOCKHOLM—STOCKING.

III., on one of the fine quays which skirt the chief harbor of S.; the cathedral, or St. Nicolai's; the Knights' Hall, with the adjoining market, ornamented with the fine statue of Gustavus Vasa; the Council-house; the Riddarsholm Kirke, where all the kings of Sweden since Charles X. have been buried; etc. Among other public buildings, most noteworthy are the Observatory, the Church of St. James, the College of Surgery, and the Opera-house, with the neighboring and corresponding palace, in the aristocratic quarter of Norrmalm, which, with the new parade-ground, its public gardens, and its fine wide and even streets, ranks as the handsomest part of the town. The most picturesque of the nine islets of S. is the Södermalm, on whose steep sides the houses, connected more frequently by steps than roads, rise in terraced rows to the even summit, crowned by St. Catherine's Church. Numerous public gardens, summer palaces, and country-houses extend along the n.e. shores of the lake and on the margins of the Ladugaard's Holm, whose central portions present a picturesque blending of rocks, wooded heights, and romantic glens. On this side of S. lies the famous Djurgaard, or Zoological Gardens, one of the finest public parks in Europe, occupying a peninsula two m. long and one m. wide, whose natural beauties have been enhanced by art. Stone and wooden bridges connect the various islands of the town. The water penetrates the town in all directions: small steamers run, as omnibuses connecting different parts of the city. The streets of the older quarters are narrow, crooked, and ill paved; but in the better parts are fine straight streets and capacious squares and open places, with well-built stone houses.

S. is the seat of the govt. and of the chief courts of law and administration, the residence of the sovereign, and the place of assembly for the legislative chambers. It is the centre of the literary and social activity of the country and has numerous scientific, artistic, educational, and benevolent institutions. In its immediate vicinity are the Karlsberg Acad. for naval and milit. cadets; and the Ulriksdal Hospital, for invalided soldiers. No city has more picturesque environs, or more numerous public gardens and walks, than S.; while the many channels and canals connected with its large and commodious harbors facilitate traffic and intercommunication with the interior, and with foreign ports. S. is the principal emporium of Swedish commerce; iron, timber, and deal planks are its main exports; but it is the centre of active trade also in the manufactures of the place—e.g., leather, cotton, woolen, and silk fabrics, glass and porcelain, iron and steel goods, steam-engines, etc., which it distributes with the ordinary colonial and other imports, to other towns of Sweden.—Pop. (1800) 75,000; (1860) 112,391; (1870) 136,016; (1880) 168,775; (1885) 215,688; (1890) 246,154; (1901) 303,356.

STOCKING, *n.* *stōk'ing* [see STOCK: Ger. *stock*, stump of a tree]: cover for the *stock* or leg; cotton or worsted or other close covering for the foot and leg: see HOSIERY: STOCKING-FRAME.

STOCKING-FRAME.

STOCKING-FRAME: machine for weaving stockings, knitting drawers, and similar garments. At first, as invented by William Lee of Woodborough, Nottinghamshire, England, it was very simple, but has now become extremely complicated, though the simple principle of its original is retained as the essential. Its beginning was

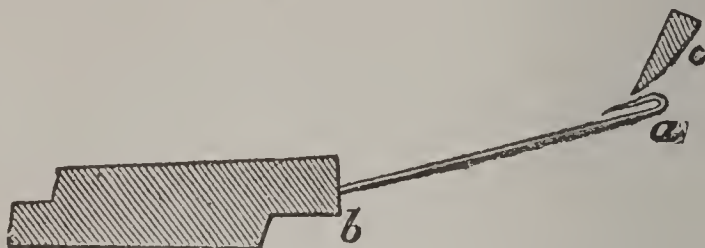


Fig. 1.

from the art of Knitting (q.v.). In knitting only one thread is used, and this formed into a succession of loops on a knitting-needle; each of these loops, then, has in succession another loop passed through it by means of another and similar needle, and this operation is carried on successively until the whole fabric is made. In the S.-F., instead of

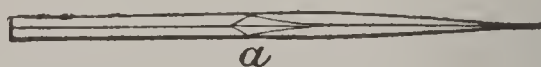


Fig. 2.

one needle to hold the stationary loops while those of the moving row are being inserted, there are as many needles as there are to be loops in the breadth of the web, and these are so made as alternately to form and give off the loops. The form of this needle is shown in fig. 1, and fig.

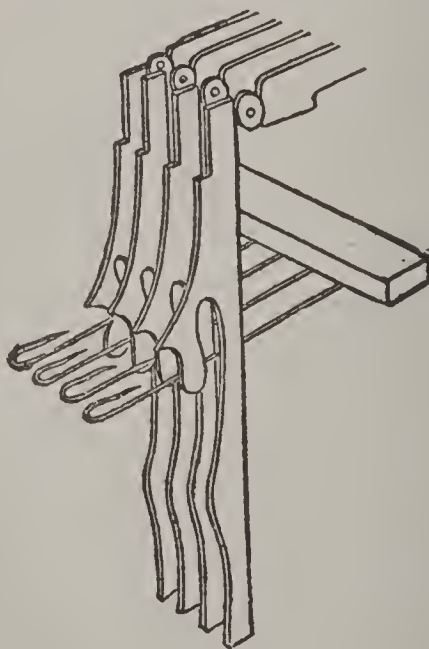


Fig. 3.

2 shows a front view of its point, in order to exhibit a small indentation, *a*, into which the bent point of the needle *a* (fig.1), is easily pressed. The other end of the needle is fixed into a small casting of tin, *b* (fig. 1), formed to fit into a frame, and to be screwed tightly in, side by side with the rest of the needles. Between the needles are

STOCKING-FRAME.

placed thin plates of lead or pewter, called *sinkers* (fig. 3), in two rows; in one row, the sinkers move freely on an axis (fig. 3); in the other, they all are fixed to a bar, and move with it. The object of the loose ones, or *jack-sinkers*, is to make loops by pressing the thread down between the needles (fig. 4 and 5 at *a*). The other row on the bar, or *lead-sinkers*, are brought down, to press simultaneously on the hooks of the needles, and press their points down into

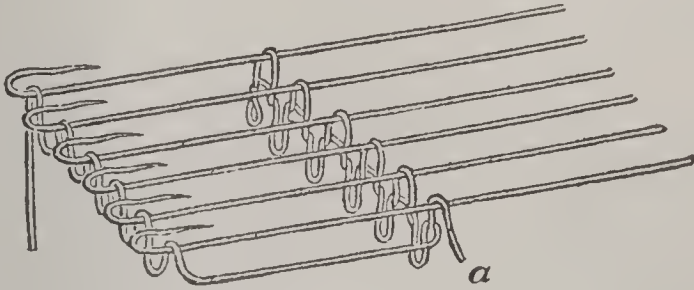


Fig. 4.

the little depression *a* (fig. 2), so that they will pass through the loops without catching one way, and take them up when opened and drawn in the contrary direction. The

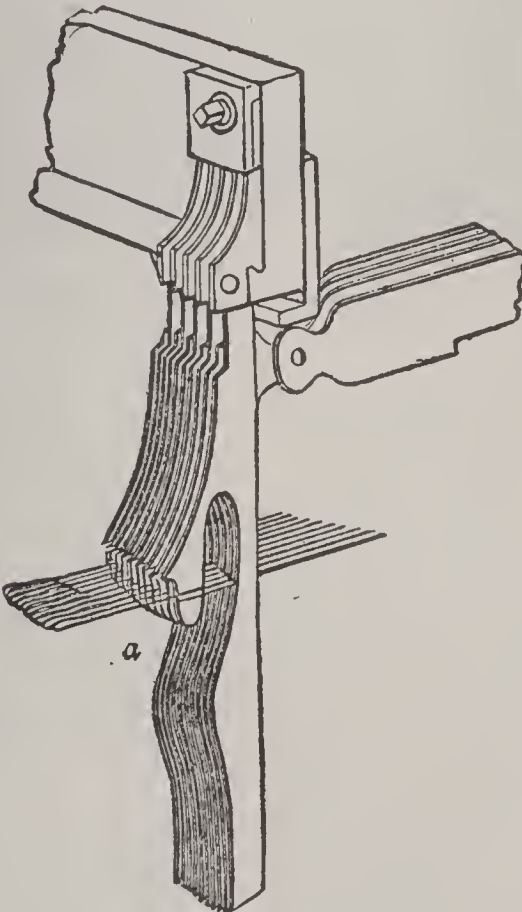


Fig. 5.

point of the lead-sinker is seen in fig. 1, *c*. These are the essential parts of a S.-F., which contains so vast a number of needles and sinkers, and such nice mechanical arrangements for giving them their regular movements, that few machines have so complicated an appearance to the observer.

STOCKPORT—STOCKTON.

STOCKPORT, *stök'pört*: town of England, county of Cheshire, and partly of Lancashire, on the river Mersey, 6½ m. s.e. of Manchester by railway, 46 m. e.n.e. of Chester, 37 m. e. of Liverpool. The site is very uneven, so that the streets are irregular, and some are precipitous. S. is of great antiquity, but its prosperity is modern. It has extensive manufactures of cottons, woollens, silks, machinery, brass and iron goods, shuttles, and brushes. Pop. (1871) 53,014; (1881) 59,544; (1891) 70,253; (1901) 78,871.

STOCKS: apparatus of wood, much used in former times in England for punishment of petty offenders. The



Stocks.

culprit was placed on a bench, with his ankles fastened in holes under a movable board, and was kept there for an hour or two. The period when S. were introduced is uncertain; but in the second Statute of Laborers, 25 Edw. III. (1350), provision is made for applying the S. to unruly artificers; and 1376, the commons prayed Edward III. that S. should be established in every village. Each parish had in later times its S., usually close to the churchyard, but sometimes in a more retired spot; and in some country places they still are or were recently seen, and not entirely disused. Combined with the stocks was often a whipping-post for flagellation of vagrants.

STOCKTON, *stök'ton*: city, cap. of San Joaquin co., Cal.; on a branch of the San Joaquin river and the Central Pacific railroad; 48 m. s.e. of Sacramento, 92 m. (by rail) e.-by-n. of San Francisco. The branch of the river, known as Stockton Channel, is navigable for steam and sailing vessels of 500 tons from the city to the river. 3 m., and on it large quantities of wheat are annually shipped. The city is on a plain, is regularly laid out and tastefully ornamented, is supplied with water chiefly by artesian wells, and has a delightful equable climate. It has gas and electric lights; horse and electric street rail-

STOCKTON.

roads; regular steamboat communication with San Francisco; 16 churches, many of high architectural richness; new co. court-house, State Asylum for the Insane; Rom. Cath. convent; 2 public libraries; 6 public schools; Mechanics' Institute; 1 national bank (cap. \$200,000); 2 state banks (cap. \$458,580), 2 savings banks (cap. \$800,000); and 4 daily and 4 weekly periodicals. S. is the business centre of the San Joaquin valley, and one of the most important wheat-markets in Cal. Its grain warehouses have combined storage capacity of more than 3,000,000 bushels. The principal industries besides handling of grain are the manufacture of flour, agricultural implements, paper, woolen goods, leather, carriages, furniture, foundry products, and soap. S. was laid out 1849, attained large business importance during the early mining excitement, and after the mining reaction became the centre of trade for a large agricultural region. Pop. (1880) 10,282; (1890) 14,424; (1900) 17,506.

STOCK'TON, FRANCIS RICHARD: journalist and author: b. Philadelphia, 1834, Apr. 5. After a high-school course, he was a draughtsman and engraver 1852; invented a double graver; and engaged in journalism, in positions successively on the *Philadelphia Post*, New York *Hearth and Home*, *Scribner's Monthly*, and *St. Nicholas* magazine. His *Ting-a-Ling Stories*, for juvenile reading, were collected and published 1870; and similar stories of his in volume form have been issued frequently. Some of his short stories for adult readers have become noted, such as *A Tale of Negative Gravity*; and *The Lady or the Tiger?* the latter propounding an unanswered question of choice between love and jealousy. Many of his stories and novels have become exceedingly popular, being unsurpassed in oddity of situations and the quietest matter-of-fact way of narrating the incredible, with a humor whose charm is peculiarly his own. *The Casting Away of Mrs. Lecks and Mrs. Aleshine* (1886) details with the gravest simplicity an impossible degree of presence of mind in the heroines, who are cast into situations at once most trying and deliciously grotesque. *The Dusantes* (1888) is its sequel. Other works are, *Rudder Grange* (1879), and its continuation *The Rudder Grangers Abroad*; *The Hundredth Man* (1887); *Amos Kilbright* (1888); *Personally Conducted* (1889); *The Great War Syndicate*; *Three Burglars*, etc. He died 1902, April 20.

STOCK'TON, RICHARD: patriot: 1730, Oct. 1—1781, Feb. 28; b. near Princeton, N. J.; great-grandson of Richard S., who, before 1670, emigrated from England, and about 1680 bought 6,400 acres in N. J. around the present site of Princeton. S. graduated from Princeton College 1748, studied law at Newark, was admitted to practice 1754, and soon became eminent in his profession. He went to England and Scotland 1766; induced Dr. Witherspoon to accept the presidency of Princeton College; soon after his return became a member of the executive council of N. J.; and 1774 was made a judge of the supreme court. He suggested a compromise for the troubles with the mother country, but afterward favored resistance by the

STOCKTON—STOCKTON-ON-TEES.

colonies; was a member of the continental congress, and signed the Declaration of Independence; was chosen chief-justice when N. J. became a state, but declined to serve; was an inspector of the army; was taken prisoner by the British 1776, and so severely treated that his health was greatly impaired. He died at his home near Princeton, N. J.

STOCK'TON, ROBERT FIELD: naval commander: 1796–1866, Oct. 7; b. Princeton, N. J.; grandson of Richard S., signer of the Declaration of Independence. Leaving Princeton Coll. at 15 years of age, he became midshipman, and was promoted junior lieutenant. 1814, for gallantry in battles of the frigate *President*. The next year he served on the *Spitfire* as first lieutenant in the Algerine war, showing intrepidity in boarding a war-vessel of the enemy with only a boat's crew. In command of the *Erie*, he was sent to the African coast to aid the Colonization Soc., and secured land for the colony of Liberia; also captured vessels in the slave-trade, and a Portuguese privateer; for some of which acts he was called to account, but justified by the courts. Later, he broke up a rendezvous of pirates in the W. Indies. After 1830 he gave attention to planning steam war-vessels, resulting in the completion of the *Princeton* 1844, long a model of construction here and abroad. In 1847 he finished the conquest of Cal. with a force of about 1,500 men, more than a third of whom were sailors. Resigning from the navy 1849, he was in the U. S. senate 1851–53, successfully carrying through, among other measures, the abolition of flogging in the navy. He was pres. of the Del. and Raritan Canal Company in his latter years, and died at Princeton.

STOCK'TON, THOMAS HEWLINGS, D.D.: 1808, June 4—1868, Oct. 9; b. Mount Holly, N. J. After studying medicine, he became a minister of the Meth. Prot. Church, preached in Md., removed to Philadelphia 1838 to secure greater freedom in discussing the slavery question, was for three years in Cincinnati, and 1850–56 was associate pastor of a Meth. Prot. church in Baltimore. In 1856 he became pastor of an independent church in Philadelphia, with which he remained till his death. He was chaplain of the U. S. senate 1862, and had been chaplain of the house of representatives for several years. Dr. S. was a very fervid and powerful preacher. He was prominent in the anti-slavery movement and in various reforms. Among his books were *Sermons for the People* (1854), and *Influence of the United States on Christendom* (1865).

STOCKTON-ON-TEES, -tēz: municipal and parliamentary borough and seaport in Durham, England; 11 m. e.n.e. of Darlington, 20 m. s.s.e. of Durham; on the left bank of the Tees. The broad and handsome High street is nearly a mile in length, and from it several minor streets diverge at right angles. A new town, South S., has sprung up in recent years on the right bank of the river. The town contains two churches, a Rom. Cath. chapel designed by Pugin, several dissenting chapels, an athenæum, and other important edifices. The S. races

STODDARD.

are held here annually.—Ship-building, chiefly in iron, is very extensive; and blast-furnaces, foundries, engine-works, and great iron-works and potteries are in operation. Sail-cloth, ropes, linen, and diapers are manufactured; and there are breweries, corn-mills, and spinning-mills. Exports are chiefly iron and earthenware; imports are corn, timber in deals, spars, etc., and bark. There entered the port (1885) 649 vessels of 149,628 tons; cleared, 700 vessels of 175,647 tons. The town is connected with the whole railway system of England and Scotland by the North-eastern railway and its branches, and there are two stations here. The Stockton and Darlington railway, the first in the United Kingdom for passenger traffic, was opened 1825.—At S. the Tees is navigable for vessels of large tonnage; by a cut, avoiding a bend of the river, the distance to the sea is shortened 3 m.: the navigation of the river has been much improved, and facilities for extensive trade provided.

S. suffered severely from incursions of the Scots in the early part of the 14th c., but even then it had considerable trade. It was captured for the parliament 1644, and destroyed by the roundheads 1652. At the restoration it had only 120 houses, mostly of clay.—Pop. parliamentary borough (1881) 55,446; (1891) 70,253: of which South S. had (1881) 10,665.

STODDARD, *stōd'erd*, Amos: soldier and author: 1762, Oct. 26—1813, May 11; b. Woodbury, Conn. He was in the revolutionary war from 1779 till its close; then became clerk of the supreme court of Mass.; afterward practiced law several years in Hallowell, Me.; was appointed capt. of artillery 1798, maj. 1807; gov. of Mo. Terr. 1804–5, and deputy quartermaster 1812. He wrote *The Political Crisis*, and *Sketches, Historical and Descriptive, of Louisiana*. He was mortally wounded at the siege of Fort Meigs, Ohio.

STOD'DARD, DAVID TAPPAN: 1818, Dec. 2—1857, June 22; b. Northampton, Mass.: missionary. While at Williams Coll. two years, he made original observations with telescopes constructed by himself. Graduated at Yale 1838, he was tutor in Marshall Coll., Penn.; studied at Andover Theol. Seminary one year; was tutor at Yale 1840; and went as missionary of the Amer. Board to the Nestorians 1843. His wife dying, he returned 1848, spending 3 years in missionary service in this country. In 1851 he resumed his work at Oroomiah, Persia; and there he died. He was a model missionary. He completed a *Grammar of Modern Syrian Language* 1853, pub. by the Amer. Oriental Soc. 1855. He also wrote in that language many religious and school tracts.—See Memoir by Rev. J. P. Thompson, 1858.

STOD'DARD, RICHARD HENRY: poet: b. Hingham, Mass., 1825, July. His father, a sea-captain, was lost at sea; his mother had a hard struggle with poverty, removing from place to place in New England, finally settling in New York, where the son sold matches, was an office-boy, a tailor's drudge, a blacksmith's apprentice, and, from

STODDARD—STÆCHIOLOGY.

his 18th to his 21st year, an iron-molder. His nights were given to study of poetry, and he soon applied himself to literary work. For 20 years he had a position in the New York custom-house. Before 1850 his fugitive poems attracted attention, for their spirit and finish; and he has since published much in poetry and prose. His extensive acquaintance with literature and keen perceptions made him a critic and literary editor much in demand; and he won success, east and west, as a serial lecturer on literature. His first collection of poems appeared 1849; the second, *Footprints*, 1852. Afterward, besides several volumes of children's books in verse or prose, he also published *Songs of Summer* (1857); *The Loves and Heroines of the Poets* (1862); *The King's Bell* (1862); *Abraham Lincoln* (1865), an ode; *Putnam, the Brave* (1869); *The Book of the East* (1867); and has edited *The Last Political Writings of Gen. Nathaniel Lyon* (1861); *Melodies and Madrigals* (1865), from old Eng. poets; *The Late English Poets* (1865); enlarged editions of Griswold's Amer. poets; *Bric-a-Brac Series* (1874). *The Lion's Cub and Other Verse*. He d. 1903.—ELIZARETH BARSTOW S., his wife, b. Mattapoissett, Mass., 1823, May 6, published commendable poems, and several noteworthy New England romances: *The Morgesons* (1862); *Two Men* (1865). She died 1902.

STOD'DARD, SOLOMON: Congl. minister: 1643–1729, Feb. 11; b. Boston. He graduated at Harvard 1662, and was the first librarian of that institution, 1667; and for two years was chaplain of Gov. Serle in the island of Barbadoes. From 1669 to his death he was pastor of the Congl. Church at Northampton, Mass., his grandson Jonathan Edwards (q.v.) becoming his colleague 1727. He published *The Doctrine of Instituted Churches* (1700), advocating the doctrine that the Lord's Supper is of converting influence, and that—somewhat as in the Church of England—all baptized persons should be admitted to it, even without religious awakening and experience; for opposition to which teaching and practice his colleague Jonathan Edwards was driven away from the Northampton church 50 years later. S. published also *A Guide to Christ*, and *The Safety of Appearing in the Day of Judgment in the Righteousness of Christ*.

STODDERT, stōd'ért, BENJAMIN: first secretary of the United States navy: 1751–1813, Dec. 18; b. Bladensburg, Md. At the battle of Brandywine, holding the rank of maj., he was wounded, and retired from the service. He was U. S. secretary of the navy 1798, May–1801, Mar., administering that office with exemplary energy. He was the trusty friend and adviser of Pres. John Adams. In private life he was a merchant of Georgetown, D. C.

STÆCHIOLOGY, n. stē-kī-ōl'ō-jī [Gr. *stoichei'on*, a first principle; *logos*, speech]: treatise on the elements or proximate principles which compose a body. STÆ'CHIOLOG'ICAL, a. -lōj'ī-kāl, of or pertaining to the elementary substances.

STOIC.

STOIC, n. *stō'ik* [Gr. *stōi'kos*, pert. to the porch—from *stōā*, the porch, especially the porch where Zeno taught: It. *stoico*; F. *stoïque*, Stoical]: one of the sect of philosophers called *Stoics*, founded by Zeno of Citium, who taught in a porch at Athens that men should be free from passion, and be unmoved by the joys or sorrows of life (see ZENO OF CITIUM): one regulating his conduct according to the doctrines of the Stoics. STO'IC, a., or STO'ICAL, a. -*ī-kāl*, pert. to the Stoics or their doctrines; unaffected by passion; unfeeling. STO'ICALLY, ad. -*lī*. STO'ICISM, n. -*sīzm*, the doctrines and maxims of the Stoics; a real or pretended indifference to pleasure or pain. STO'ICALNESS, n. -*kāl-nēs*, the state of being indifferent to pleasure or pain.—The *Stoics* were an ancient school of philosophers, and as a sect of moralists were opposed to the Epicureans in their views of human life. The Stoical system dates from the end of B.C. 4th c.: it was derived from the system of the Cynics, whose founder, Antisthenes (q.v.), was a disciple of Socrates (q.v.): see CYNIC, and titles there referred to. Indeed, the doctrines, but still more the manner of life, and most of all the death, of Socrates, were the chief foundations of the Stoical philosophy.

The founder of the system was ZENO of Citium (q.v.), who lived in the last part of B.C. 4th c., and who derived his first impulse from Crates the Cynic. He opened his school in a building or porch, called the *Stoa Pæcile* ('Painted Corridor'), on the n. side of the market-place at Athens, whence the name. Zeno had for his disciple CLEANTHES, from Assos in the Troad, B.C. 300–220, whose *Hymn to Jupiter* is the only fragment of any length that has come down to us from the early Stoics, and is a remarkable production, setting forth the unity of God, His omnipotence, and His moral government. CHRYSIPPUS, from Soli in Cilicia, B.C. 280–207, followed Cleanthes, and, in his voluminous writings, both defended and modified the Stoical creed. These three represent the first period of the system, about B.C. 304–205.—The second period, B.C. 205–50, embraces its general promulgation, and its introduction to the Romans. Chrysippus was succeeded by ZENO of Sidon, and DIOGENES of Babylon; then followed ANTIPATER of Tarsus, who taught PANÆTIUS of Rhodes (died B.C. 112), who taught POSIDONIUS of Apamea in Syria. (Two philosophers besides Chrysippus are mentioned from the native province of the apostle Paul—Athenodorus, from Cana in Cilicia; and Archedemus, from Tarsus, the apostle's birthplace. It is remarked by Sir A. Grant, that almost all the first Stoics were of Asiatic birth; and the system itself is undeniably more akin to the oriental mind than to the Greek.) Posidonius was acquainted with Marius and Pompey, and taught Cicero; but the moral treatise of Cicero, *De Officiis*, is derived from a work of Panætius.—The third period of Stoicism, after B.C. 50, is Roman. In this period we have Cato the Younger, who invited to his house the philosopher Athenodorus; and, under the empire, the three Stoic philosophers whose writings have come down to us

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—SENECA, B.C. 6—A.D. 65, EPICETUS, A.D. 60-140, who began life as a slave, and Emperor MARCUS AURELIUS ANTONINUS, 121-180. Stoicism prevailed widely in the Roman world, though not to the exclusion of Epicurean views. As a philosophy in general, Stoicism was a system of materialism, but of dynamic materialism, tracing all things back to Force; and a system of monism or of pantheism. Its philosophical tendency was to reduce all existences to abstractions.

The leading Stoical doctrines are given in certain phrases or expressions, as 'Life according to Nature,' the ideal 'Wise Man,' 'Apathy' or equanimity of mind, the power of the 'Will,' the worship of 'Duty,' the constant 'Advance' in virtue, etc. But perspicuity will be best gained by considering the *Moral* system under four heads—the Theology; the Psychology or theory of mind; the theory of the Good or human Happiness; and the scheme of Virtue or Duty.

I. The Theological doctrines of the Stoics comprehended their system of the Universe, and of man's position in it. They held that the Universe is governed by one good and wise God, together with inferior or subordinate deities. God exercises a moral government; under it the good are happy, while misfortunes happen to the wicked. According to Epictetus, God is the father of men; Antoninus exults in the beautiful arrangement of all things. They did not admit that the Deity intermeddled in the smaller affairs; they allowed that omens and oracles might be accepted as signs of the foreordained arrangement of God. They held this foreordination even to the length of fatalism, and made the same replies as have been given in modern times, to the difficulty of reconciling it with Free-will, which in their system was unusually prominent. As to the existence of evil, they offered explanations such as the following: God is the author of all things except wickedness; the very nature of good supposes its contrast evil, and the two are inseparable, like light and dark, which may be called the argument from Relativity; in the enormous extent of the Universe, some things must be neglected; when evil happens to the good, it is not as a punishment, but as connected with a different dispensation; parts of the world may be presided over by evil demons; what we call evil may not be evil.

Like most other ancient schools, the S. held God to be corporeal like man; Body is the only substance; nothing incorporeal could act on what is corporeal; the First Cause of all, God or Zeus, is the primeval fire, emanating from which is the soul of man in the form of a warm ether.

It is for human beings to recognize the Universe as governed by universal Law, and not only to raise their minds to the comprehension of it, but to enter into the views of the Creator, who must regard all interests equally; we are to be, as it were, in league with him, to merge self in the universal Order, to think only of that, and its welfare. As two is greater than one, the interests of the whole world are infinitely greater than the interests of any single

being, and no one should be satisfied with a regard to anything less than the whole. By this elevation of view, we are necessarily raised far above the consideration of the petty events befalling ourselves. The grand effort of human reason is thus to rise to the abstraction or totality of entire Nature; 'no ethical subject,' says Chrysippus, 'could be rightly approached except from the preconsideration of entire Nature, and the ordering of the whole.'

As to Immortality, the S. precluded themselves, by holding the theory of the *absorption* of the individual soul at death into the divine essence; but, on the other hand, their doctrine of advance and aspiration is what has in all times been the main natural argument for the immortality of the soul. For the most part, they kept themselves undecided as to this great doctrine, giving it as an alternative, reasoning as to our conduct on either supposition, and submitting to the pleasure of God in this as in all other things.

In arguing for the existence of Divine power and government, they employed what has been called the argument from Design, which is as old as Socrates. Man is conscious that he is himself an intellectual or spiritual power, from which, by analogy, he is led to believe that a greater power pervades the universe, as intellect pervades humanity.

II. The Constitution of the Mind. We have bodies like animals, but reason or intelligence like the gods. Animals have instinctive principles of action; man alone has a rational, intelligent soul. According to Antoninus, we come into contact with Deity by our intellectual part, and our highest life is thus the divine life.

But the most important Stoical doctrine respecting the nature of man is the recognition of Reason as a superior power or faculty that subordinates all the rest—the governing intelligence. (Very nearly the same phraseology is used by Bp. Butler in setting forth the supremacy of Conscience.) This, however, is not a mere intellectual principle, but an active force, uniting intellect and will. The bodily sensibilities are opposed to this higher Reason and Will, which, however, is strong enough to control them. Another way of expressing the same view was the power of the Mind over the Body, set forth by Epictetus in exaggerated form. The introduction of so glaring a mistake, as that sickness may affect the body without enfeebling the mind, could end only in practical failures, or else in contradiction.

In order to maintain their contrast with the Epicureans, the S. said that pleasure and pain are not principles of Nature; by which they must have meant that humanity is not in fact, at least exclusively, governed by these, and that, in the regenerated man, they are not governing principles at all. Now, it is true, and a truth important for many practical purposes, that we are sometimes impelled to action without reference to our pleasures and pains, our habits often exemplify this state; it is still better shown in what are called 'fixed ideas,' as in involuntary imitation

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and sympathy. But these are exceptions; and any system that sets itself against the main fact, that pleasure and pain are among the great moving forces of mankind, must somewhere contradict itself.

In Seneca, we find something closely approaching the Christian doctrine of the corruption of human nature. The littleness of humanity was a favorite theme of Antoninus, and naturally followed from the Stoical mode of contemplating the Universe at large.

The doctrine called the Freedom of Will may be said to have originated with the S., though with them it was chiefly a rhetorical mode of expressing the dignity of the Wise Man, and his power of rising superior to circumstances.

To prepare the way for the Stoical precepts, Epictetus distinguished between things in our power and things not in our power. The things in our power are our opinions and notions about objects, and all our affections, desires, and aversions; the things not in our power are our bodies, wealth, honor, rank, authority, etc., and their opposites. The application is this: wealth and high rank may not be in our power, but we have the power to form an *idea* of these—namely, that they are unimportant, whence the want of them will not grieve us. A still more pointed application is to death, whose force is entirely in the idea.

III. The Stoical Theory of Happiness, or rather of the Good, which with them was not identified with happiness. They began by asserting that happiness is not necessary, and may be dispensed with, and that pain is no evil, which, however, if followed consistently, would dispense with all morality and all human endeavor. Substantially and practically, they held that pains are an evil, but, by a proper discipline, may be triumphed over. They disallowed the direct and ostensible pursuit of pleasure as an end (the point of view of Epicurus), but allured their followers partly by promising them the victory over pain, partly by certain enjoyments of an elevated cast that grew out of their plan of life.

Pain of every kind, whether from the casualties of existence, or from the severity of the Stoical virtues, was to be met by a discipline of endurance, a hardening process, which, if persisted in, would succeed in reducing the mind to a state of Apathy or indifference. A great many reflections were suggested in aid of this education. The influence of exercise and repetition in adapting the system to any new function, was illustrated by the Olympian combatants, and by the Lacedæmonian youth who endured scourging without complaint. Great stress was laid on the instability of pleasure, and the constant liability to accidents; whence we should always be anticipating and adapting ourselves to the worst that could happen, so as never to be in a state where anything could ruffle the mind. It was pointed out how much might still be made of the worst circumstances—poverty, banishment, public odium, sickness, old age—and every consideration was advanced

that could 'arm the obdurate breast with stubborn patience, as with triple steel.'

It has often been remarked that such a discipline of endurance was peculiarly suited to the unsettled condition of the world at the time, when any man, besides the ordinary evils of life, might in a moment be sent into exile, or sold into slavery. Moreover, it is a discipline adapted to a certain class of dispositions existing in all ages—the men that prefer above all things 'equanimity' of mind, and would rather dispense with great occasional pleasures than risk their state of habitual composure.

Next to the discipline of endurance, we must rank the complacent sentiment of Pride, which the Stoic might justly feel in his conquest of himself, and in his lofty independence and superiority to the casualties of life. The pride of the Cynic, the Stoic's predecessor, was prominent and offensive, showing itself in scurrility and contempt toward everybody else; the Stoical pride was a refinement on this, but was still a comfortable sentiment of superiority, which helped to compensate for the surrender of indulgencies. It was usual to bestow extravagant laudation on the 'Wise Man;' and every Stoic could take this home to the extent that he considered himself as approaching that great ideal.

The last and most elevated form of Stoical happiness was the satisfaction of contemplating the Universe and God. Epictetus says that we can discern the providence that rules the world, if we possess two things—the power of seeing all that happens with respect to each thing, and a grateful disposition. The work of Antoninus is full of studies of Nature in the devout spirit of 'passing from Nature to Nature's God;' he is never weary of expressing his thorough contentment with the course of natural events, and his sense of the beauties and fitness of everything. Old age has its grace, and death is the becoming termination. This high strain of exulting contemplation reconciled him to that complete submission to whatever might befall, which was the essential feature of the 'Life according to Nature.'

IV. The Stoical theory of Virtue is implicated in their ideas of the Good, now described.

The fountain of all virtue is manifestly the life according to nature, as being the life of subordination of self to more general interests—to family, country, mankind, the universe. If a man is prepared to consider himself absolutely nothing in comparison with the universal interest, and to regard it as the sole end of life, he has embraced an ideal of virtue of the loftiest order. Accordingly, the S. were the first to preach what is called 'Cosmopolitanism;' for though, in their reference to the good of the whole, they confounded together sentient life and inanimate objects—rocks, plants, etc., solicitude for which was misspent labor—yet they were thus enabled to reach the conception of the universal brotherhood of mankind, and could not but include in their regards the brute creation. They said: 'There is no difference between Greeks and Barbarians; the world is our city.' Seneca urges kindness to slaves,

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for 'are they not men like ourselves, breathing the same air, living and dying like ourselves?'

The Epicureans declined, as much as possible, interference in public affairs, but the Stoical philosophers all urged men to the duties of active citizenship. Although there had been many good and noble men among the pagans, yet positive beneficence had not been preached as a virtue prior to the Stoics. They adopted the four Cardinal Virtues (Wisdom, or the Knowledge of Good and Evil; Justice; Fortitude; Temperance) as part of their plan of the virtuous life, the life according to nature. Justice, as the social virtue, was placed above all the rest. But most interesting to us are the indications of the idea of Beneficence. Epictetus is earnest in his exhortations to forgiveness of injuries. Antoninus often enforces the same virtue, and suggests considerations in aid of the practice of it; he contends as strongly as Butler and Hume for the existence of a principle of pure, that is, unselfish benevolence in the mind, in other words, that we are made to advance each other's happiness.

There is also in the Stoical system a recognition of duties to God, and of morality as based on piety. Not only are all men brethren, but also the 'children of one Father.'

The extraordinary stress on human nature by the full Stoic ideal of submerging self in the larger interests of being, led to various compromises. The rigid following out of the ideal issued in one of the Paradoxes, namely, that all the actions of the wise man are equally perfect, and that, short of the standard of perfection, all faults and vices are equal; that, for example, the man that killed a cock without good reason was as guilty as he that killed his father. This has a meaning only when we draw a line between spirituality and morality, and treat the last as worthless in comparison of the first. The later S., however, in their exhortations to special branches of duty, gave a positive value to practical virtue, irrespective of the ideal.

The idea of Duty was of Stoical origin, fostered and developed by the Roman spirit and legislation. The early S. had two different words for the 'suitable' (*kathēkon*) and the 'right' (*katorthōma*); although it is a significant fact that the 'suitable' is the lineal ancestor of our word 'duty' (through the Latin *officium*).

It was a great point with the Stoic to be conscious of 'advance,' or improvement. By self-examination, he kept himself constantly acquainted with his moral state, and it was both his duty and his satisfaction to be approaching the ideal of the perfect man. When renouncing the position of 'wise,' he yet claimed to be advancing. This idea, familiar to the modern world, was unknown to the ancients before the Stoics. It is very illustrative of the unguarded points and contradictions of Stoicism, that contentment and apathy were not to permit grief even for the loss of friends. Seneca, on one occasion, admits that he was betrayed by human weakness on this point. On strict

Stoical principles, we ought to treat the afflictions and the death of others with the same frigid indifference as our own; for why should a man feel for a second person *more* than he ought to feel for himself, as a mere unit in the infinitude of the Universe? This is the contradiction inseparable from any system that begins by abjuring happiness from any part in the proper aim of life. We may be allowed to regard our own happiness as of no importance, but if we apply the same measure to happiness in general, we are bereft of all motives to benevolence; and virtue, instead of being set on a loftier pinnacle, is left without any foundation.

The Stoical system has largely tintured modern ages, in spite of its severity. It has always had a charm as an ideal, even when men were conscious of not realizing it. It may be still considered as a grand experiment in the Art of Living, from which valuable lessons have resulted; just as a believer in Alchemy, or in the Perpetual Motion, might make useful experimental discoveries. The limitation of wants, the practice of contentment, the striving after equanimity, the hardening of one's self against the blows of fortune, all are familiar to the moralists of later ages. A qualified form of subordination of self to the general welfare belongs to all the higher modern theories of virtue; this, however, is in no sense original with Stoicism. As a general philosophy, S. is traceable as obscurely permeating and often dominating much of modern thought.

The chief ancient authorities on the S. are the writings of Epictetus, Marcus Antoninus, and Seneca, themselves Stoical philosophers; together with notices occurring in Cicero, Plutarch, Sextus Empiricus, Diogenes Laertius, and Stobæus. The completest modern account of the system occurs in Zeller's *Philosophie der Griechen*, III.: see also Sir Alexander Grant in *Oxford Essays* 1858; and *Stoicism*, by the Rev. W. W. Capes (1880).

STOKE, v. *stōk* [from STOCK, which see: Dut. *stoken*, to make a fire: OF. *estoquer*, to stab or thrust]: to poke; to stir up; to supply a furnace with fuel. STO'KING, imp.: N. the proper management of a fire connected with a steam-engine. STOKED, pp. *stōkd*. STO'KER, n. *-kēr*, one who looks after the fire of a locomotive or steam engine.

STOKES, *stōks*, GEORGE GABRIEL, LL.D.: great mathematician and natural philosopher: b. 1819, at Skreen, county Sligo, Ireland. After studying at the Bristol College, he entered Pembroke College, Cambridge, 1837; graduated 1841, as senior wrangler, and first Smith's prizeman; became fellow of Pembroke in the same year; and was elected 1849 to fill, as one of the worthiest of Newton's successors, the Lucasian chair of mathematics in Cambridge. In 1854 he was appointed sec. to the Royal Soc. —He is best known, popularly, by his beautiful discovery of Fluorescence. His paper *On the Change of the Refrangibility of Light* is printed in the *Philosophical Transactions* for 1852–3. For his recent important physiological application of optical methods to the study of the oxidation of the blood. see SPECTRUM. To mathematicians and natural

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philosophers, S. is known by a number of admirable papers in the *Cambridge Philosophical Transactions*, the *Cambridge and Dublin Mathematical Journal*, and the *Philosophical Magazine*. Notable publications by S. are: *Report on Double Refraction* to the Brit. Assoc. in 1862, *Lectures on Solar Physics* (published in *Nature*, 1881), the *Burnett Lectures on Light* (1884), and a collected issue of his *Mathematical and Physical Papers* (1880-83), which had long been wished for. He was pres. of the Brit. Assoc. 1869.

STOKE-UPON-TRENT: municipality, parliamentary borough, and manufacturing town in Staffordshire, 145 m. from London by the London and Northwestern railway. The 'district' of S. consists of the parish of S., familiarly named the 'Potteries,' and contains the towns Burslem, Hanley, Lane-End (with Longton), Stoke, and Tunstal Court. The town of S. is regularly built. Its church is an edifice in modern Gothic. The earthenware manufactures of the parish of S. are carried on in about 200 factories. In the vicinity are coal-mines. Pop. municipal borough (1881) 19,263; enlarged and adjusted (1891) 24,027; parliamentary borough, including Potteries (1881) 152,457; (1891) representation reduced one-half 1885, 75,352.

STOLBERG, stöl'bërĥ, CHRISTIAN, Count von: poet: 1748, Oct. 15—1821, Jan. 18; b. Hamburg; from one of the oldest German families. He studied at Göttingen. In 1777 he married Luise, Countess of Reventlow; and after 1800 lived in retirement on his estate of Windebye, near Eckernförde in Slesvig, where he died. As a poet, he was inferior in genius to his younger brother; but his scenes of family life have been much admired for their sincere and ardent feeling. His principal works are *Gedichte* (Leip. 1779); *Gedichte aus dem Griechischen* (Hamb. 1782); *Schauspiele mit Chören* (Leip. 1787); and *Vaterländische Gedichte* (with his brother; Hamb. 1815).

STOLBERG, FRIEDRICH-LEOPOLD, Count von: poet: 1750, Nov. 7—1819, Dec. 5; b. Bramstedt; younger bro. of Count Christian von S. He studied at Halle and Göttingen, and after a visit to Switzerland and Italy, making the acquaintance of Goethe at Frankfurt, and of Lavater at Zürich, he became, 1777, minister-plenipotentiary of the episcopal Prince of Lübeck at the court of Denmark. S. filled other official situations; but becoming a convert to Rom. Catholicism, he resigned all his employments, and lived mainly in the society of his co-religionists. The causes that led him to this step, which lost him many old and dear friends, were partly the theological strifes between the rationalists and orthodox Lutherans in Holstein—the country where he mostly resided, and partly his study of the controversial works of Rom. Cath. writers during a second visit to Italy 1790-1. He died at Sondermühlen, near Osnabrück. S. is a superior poet to his elder brother: there is greater boldness in his ideas and imagery, and wonderful facility in versification. Specimens of all sorts of poetry from him are in *Werke der Brüder Stolberg* (22 vols., Hamp. 1821-26). See *Friedr. Leopold, Graf zu Stolberg*, by Nicolovius (Mainz 1846).

STOLE.

STOLE, v. *stōl*, pt., STOLEN, v. *stōl'n*, pp., of STEAL.

STOLE, n. *stōl* [L. *stola*; Gr. *stolē*, a long, feminine upper garment—from *stellein*, to equip, to set in order: It. *stola*, a stole]: long narrow scarf of silk or stuff, fringed at the ends, and often richly embroidered, worn by Rom. Cath. and Anglican priests—and with some modification, in the Greek Church also—over the surplice, made to pass across each shoulder, and hang down in front to about the knees—that of a deacon is passed over the left shoulder, crosses the back and breast like a sash, and hangs by its two ends down the right side: in *OE.*, a long vest. The present priestly S. seems the traditionary representative of the embroidered border of the *orarium* in the Rom. Cath.



1, Stole; 2, Priest wearing the Stole, AA.

Church. It is used in some cases also as a symbol of jurisdiction; in which sense it is worn constantly by the pope, even when not officiating; and in Italy and other Rom. Cath. countries, the parish priest, after he has administered extreme unction to a sick person, *leaves the stole upon the foot of the bed, not to be withdrawn until the death or recovery of the invalid.* In the English Church the use of the S. appears to rest only on ancient custom: it is usually of black silk, fringed at the ends, with sometimes crosses embroidered. STOLED, a. *stōld*, wearing a stole or long robe. GROOM OF THE STOLE, in the *court of a sovereign*, the first lord of the bedchamber, whose original duty was to put the king's shirt on in the morning; an officer who has charge of the king's wardrobe.

STOLE, n. *stōl*, or STOLON, n. *stō'lōn* [L. *stolo*, a twig or shoot springing from the stock of a tree]: in *bot.*, a lax trailing branch given off at the summit of the root and taking root at intervals; in *zool.*, one of the connecting processes of sarcodæ in *Foraminifera*. STOLONIFEROUS, a. *stō'lōn-îf'ēr-ūs* [L. *fero*, I produce]: producing suckers, having creeping runners.

STOLEN GOODS—STOMACH.

STOLEN GOODS, PURCHASE OF: in law in the United States (differing in some respects from that in England), an act giving no more title or right than the thief had; i.e. the owner may take the goods wherever he finds them. The only exception to this rule is that money or negotiable instruments may become the property of one who buys them in good faith, even from a thief; the necessity of this exception is in the fact that without it, an incalculable risk would attach to all commercial and financial transactions, and business would be ruinously hampered.—As to giving reward for recovery of goods stolen, see **REWARD**, in Law.

STOLID, a. *stöl'id* [L. *stolidus*, dull, senseless: It. *stolido*, stolid: Gael. *stol*, to calm, to settle; *stolda*, sedate]: dull; heavy; foolish; calm and unmoved; stupid. **STOLIDITY**, n. *stō-līd'ī-tī*, dulness of intellect; stupidity: also **STOL'IDNESS**.

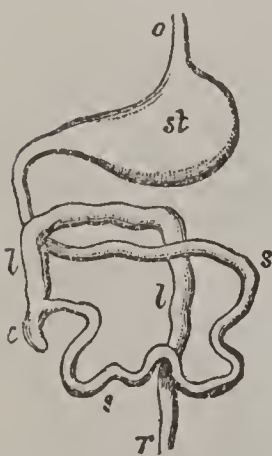
STOLON: see **STOLE 3**.

STOLP, *stōlp*, or **STOLPE**, *stōl'pēh*: garrisoned town of Prussia, chief town of a circle in the province of Pommern, on the river S. about 15 m. from its mouth, 40 m. n.e. of Kōslin. S. is composed of an old and new town, with four suburbs; has a castle, 4 churches (one the *Marienkirche*, built 1311, has a lofty tower), a hospital for invalids, amber and other manufactures, and active general trade. At the mouth of the river is Stolpmünde (pop. 1,118), the port of S.—Pop. of S. (1885) with garrison 22,442.

STOMACACE, n. *stō-māk'ā-sē* [Gr. *stoma*, the mouth; *kakos*, bad]: a fetid state of the breath and mouth.

STOMACH, n. *stūm'āk* [L. *stomachus*; Gr. *stomachōs*, the alimentary canal—from Gr. *stoma*, a mouth: OF. *estomach*; F. *estomac*, the stomach]: principal organ of digestion (see below): desire of food caused by hunger; appetite; liking; inclination; in *OE.*, anger; violence of temper; sullenness; resentment; stubbornness; haughtiness; pride: V. to brook; to resent; to bear without open resentment. **STOM'ACHING**, imp.: N. in *OE.*, resentment. **STOM'ACHED**, pp. *-ākt*, borne without open resentment: **ADJ.** filled with resentment. **STOM'ACHLESS**, a. *-lēś*, without appetite. **STOMACH-PUMP**, small pump in the form of a syringe, with flexible tube introduced through the œsophagus, for drawing off poisons or injurious liquids from the stomach, or for injecting liquids into the stomach for nourishment, etc.

STOM'ACHER, n. *-ā-kēr*, an ornamental covering worn over the breast by women. **STOMACHIC**, n. *stō-māk'ik*, a medicine or cordial which gives tone to and strengthens the stomach. **STOMACH'IC**, a., or **STOMACH'ICAL**, a. *-ī-kāl*, pertaining to the stomach; that strengthens the stomach.



Typical Mammalian Stomach.

STOMACH.

STOMACH: principal digestive organ in animals.—For the Anatomy and Physiology of this organ, see DIGESTION.

DISEASES OF THE STOMACH.—In the discussion of the diseases of any organ, it is customary to consider first its inflammation. But acute *gastritis*, or inflammation of the mucous membrane of the stomach, is rare, except from an irritant poison. Thus Louis states that during six years' experience at La Charité (one of the chief Parisian hospitals), in which he made notes of 6,000 cases of disease, and 500 dissections, he did not meet with a single case of fatal idiopathic (spontaneous) gastritis. The symptoms of gastritis from an irritant poison are a gradually increasing sensation of uneasiness or heat, which soon assumes an acute burning character in the epigastric region: this pain is accompanied with vomiting, increasingly frequent as the pain augments, and often with hiccup. There is usually extreme tenderness on pressure, and the patient bends his body forward to relax the muscular tension. During the accession of these symptoms, there is a marked excitement, indicated by acceleration of the pulse and breathing, and by heat of the skin. This condition is soon exchanged for prostration: the skin becomes cold and clammy, the pulse thready and feeble, and the breathing catching and intermittent; until finally, after a variable period of exhaustion, the patient sinks, usually retaining his mental faculties to the last. Although the above-described symptoms are always more or less present, each irritant poison occasions some special symptom and some characteristic lesion, and occasions death at different periods.

Sub-acute gastritis is not rare, and it occurs in two distinct forms—one in which the malady is caused by a constitutional state, whose effects are shown in other organs as well as in the stomach; another in which it is due to causes connected chiefly or exclusively with this organ, which is submitted to an irritative process somewhat analogous to that typified by the gastritis of irritant poisoning. The first of these forms is illustrated in certain cases of scurvy, in which, if death takes place between the third and seventh day of the disease, distinct marks of inflammation are seen in the stomach. The other variety, often chronic, is best seen in delirium tremens; the affection being sub-acute or chronic, according as it has been produced by a single prolonged debauch, or by a protracted habit of drinking spirits; the patient's final malady being induced by a deficiency of food, or by lack of the ordinary stimulant. Purely chronic inflammation may be induced by various causes, of which the most common are the abuse of alcoholic drinks, habitual excess in eating, the eating of indigestible food, and excessive use of irritating medicines.

The treatment of gastritis varies with each individual case. The first point is the removal of the cause; to be attempted in cases of irritant poisoning, either by removal of the poison (by the stomach-pump, or by emetics, e.g.,

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sulphate of zinc), or by its neutralization by an antidote. In very severe cases, leeches may be applied to the epigastrium; but counter-irritants, e.g., turpentine on a hot moist flannel, or mustard-poultices, are generally of more service. Continuous fomentation with water as hot as can be borne often gives relief; while iced water, or better, very small lumps of ice swallowed whole, usually relieve the thirst and mitigate the pain. Enemata of purgative materials, if the bowels are constipated, or soothing (e.g., 30 drops of laudanum in a little starch or gruel), if the bowels are irritable, may be prescribed with advantage. When the stomach begins to be able to retain food, it must be given in the form of a bland liquid, in small doses, at distant intervals. Chronic gastritis must be treated in much the same manner as Indigestion (q.v.): the most essential point is due regulation of diet.

Ulcer of the stomach is the most important idiopathic disease of that organ, both from its frequency, from the facility of its detection during life, from the fact that at any period of its protracted course it may prove suddenly fatal, and from its being usually curable. The first and most characteristic symptom is pain, beginning as a mere dull feeling of weight or tightness, gradually augmenting into a burning sensation, and at last assuming a gnawing character, with a sickening depression. This pain comes on in two to ten minutes after ingestion of food, and lasts an hour or two; vomiting often ensues, after which the pain ceases. The place of its most frequent appearance and greatest intensity is the centre of the epigastric region or slightly below the free end of the ensiform cartilage of the sternum; and the painful spot is usually of circular form, with diameter from one to two inches. The pain in this region is succeeded in a few weeks, by a gnawing pain in the back, ranging in position from the eighth dorsal to the second lumbar vertebra, and usually between the two shoulder-blades. The pain in both the epigastric and the dorsal region is almost always much increased by pressure; it is also specially affected by certain kinds of food and drink, being increased by hard and indigestible substances, and lessened by a bland and pulpy diet. As a general rule, the pain is aggravated by tea, beer, and hot food; though there are exceptions. The next symptom in this disease is vomiting or regurgitation, expelling the food previously taken, or a glairy alkaline fluid. The vomiting occurs usually when the pain is most intense, and is a dangerous symptom, since it tends to starve the patient, and to increase the fatigue of an already weakened frame. At this stage, the disease sometimes terminates in perforation, with rapidly fatal peritonitis; and if this accident does not occur, the dyspeptic symptoms become complicated by hemorrhage from the stomach, sometimes so rapid that it distends the stomach and adjacent small intestine with a single gush, and causes fainting and almost immediate death; but occurring usually as a slow intermittent drain of blood, giving rise to anæmia. If death from the above causes (inanition, perforation, or

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hemorrhage) does not terminate the disease, the symptoms frequently subside in something like the inverse order in which they occurred; and recovery, often after years of suffering, ensues. As to frequency of ulcer of the stomach Dr. Brinton, who carefully studied it, states that this lesion may be detected in (on an average) 5 per cent. of persons dying from all causes; that it occurs twice as frequently in females as in males, and that it is a disease specially of middle and advancing life—27 years being the average age in females, and 42 in males. Nothing is known regarding its causes, except that advancing age, privation, mental anxiety, and intemperance so frequently coincide with it, that they may be regarded as in some degree producing it. In treatment, strict attention to diet is of first importance. When the symptoms are urgent, the patient should keep the recumbent position, and should be fed on lukewarm milk, thickened with biscuit-powder, etc., in doses of one, or, at most, two tablespoonfuls every two hours. The pain is often relieved by application of a mustard-poultice to the painful spot; and benefit is frequently derived from internal administration of bismuth (in doses of ten grains), either alone or combined with the compound kino-powder (in five-grain doses). When there is hemorrhage, little lumps of ice may be swallowed; and if all food is rejected by vomiting, beef-tea injections must be thrown into the lower bowel. Aperients are sometimes required, but they must be given with caution; and if castor-oil can be taken without increasing the pain or vomiting, it is the most harmless remedy of its class.

Cancer of the stomach is obscure in symptoms and difficult of detection in its early stage; not infrequent, and always fatal. Its typical course is sketched by Dr. Brinton (*Diseases of the Stomach*): 'An elderly person, perhaps hitherto free from dyspepsia, begins to suffer from a capricious, and soon a diminished, appetite; which is by and by associated with occasional nausea, or even vomiting, and with a sense of uneasiness or distention of the stomach. His complexion; already pale and unwholesome, next acquires a muddy, yellowish, or faint greenish hue. His gastric symptoms now increase; often by a sudden and marked augmentation which corresponds to what is in other cases their first appearance. Vomiting, if already present, becomes more frequent and urgent; local uneasiness deepens into pain; and both these symptoms are excited or increased by taking food. At a somewhat later period, hemorrhage generally occurs, usually but scanty in amount, and therefore depending to a great extent on casual circumstances for its detection. About this time, a tumor often becomes perceptible near the middle of the epigastric region of the belly. As the local symptoms increase, the cachexia of the patient also augments; and is evidenced not only by the color already mentioned, but also by debility and emaciation; and at last by prostration which ends in anasarca, delirium, and death.' From the records of 600 cases, Dr. Brinton finds that most deaths from this disease occur between the ages of 50 and 60

years; and the form of cancer most frequent is the scirrhus or hard cancer. Out of 180 cases, scirrhus occurred in 130 (nearly three-fourths), medullary or encephaloid cancer in 32, colloid in 17, melanotic deposit in 3, and villous cancer in 1. In treatment of this formidable disease, more relief is given by careful diet than by any medicine. Good milk or strong beef-tea thickened with biscuit-powder, etc., may be given in the same manner as recommended in ulcer; and milk mixed with a little old Jamaica rum will sometimes stay on the stomach when everything else is vomited. If there be pain, opiates must be given; and they may be prescribed either in the ordinary way, or as enemata, the latter having the advantage of not inducing constipation.

Hæmatemesis, or *Vomiting of Blood*, is rather a symptom than a disease: thus, it may occur by the ulcerative destruction of the walls of a comparatively large blood-vessel, as in gastric ulcer and in cancer; but it generally is of the kind termed capillary. The latter kind of hemorrhage happens under various circumstances, of which the following are the principal: 1. The bleeding may be idiopathic, or unaccompanied by any structural change; this variety is extremely rare. 2. It may take the place of some habitual hemorrhage, or, in other words, be vicarious; thus it frequently takes the place of the menstrual discharge. 3. It is often a consequence of disease or injury of the stomach; e.g., it frequently occurs after ingestion of strongly irritant poisons, or even an immoderate dose of alcohol. 4. It may be a consequence of disease in adjacent viscera, occasioning an overloading of the veins of the stomach; thus it is caused frequently by enlargement of the spleen, and occurs in those states of the liver in which there is obstruction of the portal circulation; and under this category must be ranked the gastric hemorrhage frequent in advanced pregnancy, in consequence of the pressure of the enlarged uterus on the venous circulation of the abdomen. 5. It may result from changes in the composition of the blood, such as occur in scurvy, purpura, and yellow fever. The treatment must be directed against the disease on which the hemorrhage depends, rather than against the mere symptom; but from whatever cause it arises, if it is proceeding to a dangerous extent, the patient should be kept perfectly quiet in bed, and should swallow small pieces of ice. Hot applications may be applied to the extremities, to direct the blood to those parts. The medicines most likely to be of service are acetate of lead, gallic acid, dilute sulphuric acid, and oil of turpentine; but these should be given only on medical authority.

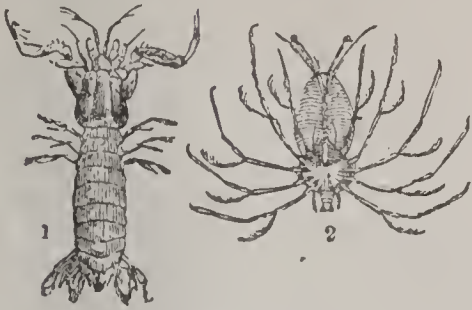
For some other affections of the stomach, see special titles—CARDIALGIA: INDIGESTION: SARCINA: ETC.

STOMAPOD, n. *stō'mă-pōd*, STOMAPODA, n. plu. *stō-măp'ō-dă*, or STOMATOPODA, n. plu. *stō'mă-tōp'ō-dă* [Gr. *stoma*, the mouth; *pous* or *poda*, the foot]: order of malacostracous crustaceans, so called from the arrangement of their thoracic or true feet in connection with the mouth, which is usually furnished with one or more pairs of jaw-

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feet: to this order *Squillidæ*, Glass-crabs, etc., belong. All are marine. They are most abundant in tropical seas, but

some are found in temperate parts of the world. They have seven or eight pair of legs, mostly near the mouth. The gills are external, adhering to the appendages beneath the abdomen, which is elongated and terminates in an extended tail fin. The rings which bear the eyes and the antennæ are not confounded with the rest



Stomapoda.

1, *Squilla stylifera*. 2, *Phyllosoma commune*.

of the head, as in the *Decapoda*, but are more distinct. The carapace often leaves the latter rings of the thorax exposed. The heart is very different from that of the *Decapoda*, assuming the form of a long cylindrical vessel throughout the length of the abdomen. The Stomapoda inhabit deep parts of the sea, many of them living at the bottom, while some, e.g., Glass-crabs, are found floating at the surface.

STOMATE, n. *stō'māt*, STO'MATES, n. plu. *-māts*, also STOMA, n. *stō'mā*, STOMATA, n. plu. *stō'mā-tā* [Gr. *stoma*, a mouth; *stomata*, mouths]: in *bot.*, minute opening in the epidermis of plants, communicating with intercellular spaces—especially in the leaves and other green parts exposed to the air. STOMATITIS, n. *stōm-ă-tī'tis*, inflammation of the mouth. STOM'ATOUS, a *-tūs*, having stomata.—*Stomata* or *Stomates* in plants were noticed first by Grew, who



a, Stomata.

1, *Strobilanthes sabiniana*. 2, *Croton variegatum*. 3, *Limnocharis plumieri*.

described them in his *Anatomy of Plants* 1682. They are formed usually by two semilunar cells, which are as lips to the orifice, and are filled with green matter; but sometimes the cells arranged around them are more numerous. They are generally of elliptical form, but sometimes circular, and sometimes quadrangular. These differences are very characteristic of particular species, genera, or orders of plants. In a moist atmosphere, they are open; but when it becomes dry, they are closed, or nearly so. It appears that they are organs of transpiration, and that their opening and closing according to the moisture or dryness of the atmosphere regulates it suitably to the requirements of the plant. They do not occur in any part of the plant covered by the soil, nor in submerged leaves, nor on the lower side of

STOMATODE—STONE.

floating leaves. Succulent plants have very few; so that these plants retain for a long time the moisture which they have imbibed, and are thus adapted for living in a dry atmosphere. Stomata are generally most abundant on the under side of leaves; but in leaves which grow vertically, they are often almost equally numerous on both sides. In general, they are irregularly placed; but in grasses and many other endogenous plants with parallel-veined leaves, they are in regular rows; and in some other plants, in little groups. The number in a sq. inch varies from 200 in the mistletoe to almost 450,000 in the under side of the leaves of *Solanum sanctum*. Stomata are not found in mosses, lichens, algæ, and fungi; but they exist in some of the *Hepaticæ*, as in *Marchantia*, in which their structure is more complex than in the higher plants; each of them consisting of a kind of shaft of four or five rings placed one upon another, every ring made up of four or five cells, and the lowest ring apparently regulating the aperture by the contraction or expansion of the cells which form it.

STOMATODE, n. *stōm'ă-tōd* [Gr. *stoma*, a mouth; *stomatos*, of a mouth]: in *zool.*, possessing a mouth, as in the so-called *stomatode* Protozoa.

STONE, n. *stōn* [AS. *stán*; Dan. and Sw. *sten*; Dut. *steen*; Ger. *stein*, a stone]: any loose mass of earthy matter of considerable hardness; popularly, a piece of rock; a mineral (see below): a Gem (q.v.): article made of stone, as a *gravestone*: a morbid secretion formed in the bladder; a disease (see CALCULUS, in Medicine: LITHOTOMY: LITHOTRITY): a testicle; hard kernel of a fruit, forming the case which contains the seed; a weight of 14 lbs.; a weight varying in amount (see below): insensibility: ADJ. made of or resembling stone; hard: V. to pelt or kill with stones; to free from stones, as fruit; to face with stones; in *OE.*, to harden. STON'ING, imp.: N. the act of one who stones by pelting; the act of separating the fruit from the hard kernel or kernels. STONED, pp. *stōnd*. STON'ER, n. *-ér*, one who or that which stones. STON'Y, a. *-ī*, made of or resembling stone; abounding in stones; hard; solid; cruel; unrelenting; pitiless; obdurate. STON'INESS, n. *-ī-nēs*, the state or quality of being stony or abounding with stones; hardness like stone. STONE-LIKE, a. having the appearance or consistence of stone. STONE'LESS, a. *-lēś*, having no stones. STONE-BLIND, completely deprived of the organs of sight. STONE-BOW, in *OE.*, a crossbow which shoots stones. STONE'S-CAST, or STONE-CAST, the distance to which a stone may be thrown by the hand. STONE-CHATTER, bird whose notes often resemble the knocking together of two stones (see STONE-CHAT). STONE-COPING, hewn stones placed on the top of a wall, and made to slope and sometimes slightly project over it. STONE-CROP, common plant of the genus *Sedum*, ord. *Crassulacææ* (see SEDUM). STONE-CUTTER, one whose occupation it is to hew or cut stones. STONE-CUTTING, the business of hewing stones (see STONE-CUTTING AND DRESSING MACHINES). STONE-DEAD, a. lifeless as a stone. STONE-FENCE, drink composed of sweet cider and apple brandy or other liquor. STONE-FLY (see below).

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STONED FRUIT, fruit deprived of its hard kernels. **STONE LILIES**, a popular name for the encrinites, in allusion to the resemblance which they bear to the flower and stalk of the lily. **STONE MASON**, one who works in stone, or builds with it. **STONE PERIOD** (see **BRONZE, AGE OF**). **STONE-POCK**, old name for a modification of smallpox, in which the vesicles dry up into hard tubercles instead of proceeding to maturation. **STONE-STILL**, motionless; perfectly still. **STONE-WARE**, coarse kind of clay-made articles for domestic use (see **POTTERY**). **STONE-WORK**, masonry; anything done in stone, or built with it. **STONY-HEARTED**, a. cruel; pitiless. **METEORIC STONES**, hard stony matter or concretions which fall through the atmosphere, and which come from some region beyond it. **PHILOSOPHER'S STONE**, a substance which it was supposed, could it be discovered, would change any other metal or material into gold. **ROCKING-STONE**, a large stone so balanced on the top of another that a slight force will cause it to move and oscillate. **TO LEAVE NO STONE UNTURNED**, to spare no exertions; to do everything that can be done.

STONE, *stōn*: market-town of Staffordshire, England; 7 m. n.n.w. of Stafford, 7 m. s. of Stoke; on the left bank of the Trent. Shoemaking, tanning, malting, and brickmaking are chief industries. Near the church are remains of an Augustinian monastery dating from the foundation of a college of canons 670.—*l'op.* (1871) 3,732; (1881) 5,669; (1891) 5,754.

STONE: a weight in use throughout n w. and central Europe, but varying much in different countries. It is employed on the continent chiefly for weighing wool, hemp, flax, and feathers, the flax-stone containing twice as many lbs. as the S. for wool and feathers. In all the principal commercial states of Germany, the S. (of flax) is the $\frac{1}{2}$ of a cwt. (centner = 100 or 112 lbs.), i.e. 20 lbs., in Prussia and the Zollverein, Hamburg, Lübeck, and Bremen; 22 lbs. in Austria, etc.; in Britain it is the $\frac{1}{4}$ of a cwt., or 14 lbs.; in Sweden it is equivalent to 32 lbs. In Great Britain, though the S. of 14 lbs. is the only legal imperial weight of the kind, stones of other values are in regular use, e.g., a S. of 24 lbs. for wool, and one of 8 lbs. for butcher-meat.—In the United States the S. is little used.

STONE: concreted earthy material; used for building, paving, millstones, grindstones, honestones, ornamental purposes, etc.: see **BUILDING STONE: QUARRY: MILL: GRINDSTONE: HONE: MARBLE: GRANITE: SLATE: ETC.**: also **STONE-CUTTING AND DRESSING MACHINES**.—Some general remarks on Building Stone are added here. The desirable properties in a building stone are, that it be compact, insoluble in water, not easily altered by the atmosphere, and not liable to take on a vegetable coating. These qualities depend on its chemical composition and on its mechanical structure. Building stones may be divided into three classes—siliceous, calcareous, and composite. Siliceous stones (including granite, porphyry, gneiss,

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greenstone, basalt, sandstone, slate, serpentine, etc., and containing 45 to 99 per cent. of silica) are, as a general rule, the most durable for building. Their durability is affected by certain of their ingredients, as by the felspar in granite, and salts of iron in sandstone. Certain ferruginous sandstones, comparatively soft when first quarried, harden by exposure. Much study has been given to the question of durability of different S., but long trial is the surest test. In the case of the brown sandstone largely used in New York, many buildings have suffered where the stone scales by exposure of surfaces parallel to the lamination. Calcareous stones (simple limestone, travertine, marble, etc.) are slightly soluble in pure water, and more so in carbonic acid water; they are liable to splinter by water freezing in their pores, are acted on by acid gases (e.g., the sulphurous acid gas produced by combustion of most kinds of coal), and are somewhat liable to be stained by minute plants. Still, some of them are lasting enough in a rural atmosphere. The failure of the magnesian limestone selected for the Brit. houses of parliament presents an instance of a stone lasting for centuries in a country church, yet quite unfit to withstand the wasting action of the atmosphere of a great city. Composite stones, in which neither the silica nor the lime greatly predominates, are unimportant. See STONE, PRESERVATION OF.

A leading account of building stones in the United States is in Gen. Q. A. Gillmore's *Strength of the Building Stone of the United States* (1874); also in the Centennial and Smithsonian Institution *Reports*, and *Transactions* of the Amer. Soc. of Civil Engineers.

ARTIFICIAL STONE.—This properly would include burned clay wares used for building purposes, e.g., bricks, Terra Cotta (q.v.), etc., as well as the various cements. We here deal with only the siliceous artificial S. produced by the cementing properties of soluble alkaline silicates on sand, which has been the subject of many experiments. In 1825 Prof. J. N. von Fuchs, of Munich, published a paper on various applications of these silicates, and so laid the foundation of a new industry. To Kuhlmann, of Lille, however, is mainly due the practical application of the art. The process, as at first practiced by Ransome, of Ipswich, England, consisted in mixing the gelatinous silicate of soda with sand and a little powdered glass and clay, in the proportions of sand, 10 parts; glass, 1 part; clay, 1 part; silicate of soda, 1 part: these ingredients were thoroughly incorporated in a pug-mill, and brought to the consistency of putty. The plastic nature of the substance at this stage allows it to be molded with ease into an endless variety of forms, even elaborately ornamental. After leaving the molds, the objects are dried in close ovens, and then removed to kilns, where they are fired at gradually increasing temperature, which finally reaches red heat. In the kiln the goods are bedded up in dry sand, to prevent any of the twisting or loss of shape which commonly disfigures large objects

in baked clay. When the firing is completed, the material is a semi-vitrified mass, with the appearance, properties, and composition of a fine sandstone.

A later patent by Ransome consists in producing a hard and durable material altogether without baking, by effecting a double decomposition with the silicate of soda and the chloride of calcium. Such materials as sand, chalk, or other minerals are intimately mixed with a proper quantity of a solution of silicate of soda, this being secured, as before, by the operations of a pug-mill. In this plastic condition they are molded into any required form, after which they are saturated with a solution of chloride of calcium. The silica combining with the calcium forms at once an insoluble silicate of lime, which cements into a firm mass all the particles of sand, lime, etc., used in the composition. The chlorine, on the other hand, combines with the soda to form common salt (chloride of sodium), readily removed by washing. To avoid the difficulty of removing all traces of chloride of calcium from artificial stone made by this last process, Ransome, 1872, succeeded in making a very compact stone by mixing lime and a natural soluble silica, found in a rock forming a stratum of the lower chalk in Surrey, with sand and silicate of soda: in strength this material excels Portland stone, not breaking so readily by a given transverse strain.

The objects into which artificial stone is manufactured are very miscellaneous; whatever, in fact, is made of real stone can be formed also in the artificial. Among prominent applications of it are grindstones, millstones, tombstones, monuments, chimney-pieces, balustrades, fountains, vases, and statuary.—See Gen. Q. A. Gillmore's *Béton, and Other Artificial Stones* (1871), and *Portland, Roman, and Other Cements and Artificial Stones* (1876).

STONE, *stōn*, ANDREW LEETE, D.D.: Congregational minister: b. Oxford, Conn., 1815, Nov. 25; son of Dr. Noah S., judge of probate, who was cousin of William Leete S. He graduated at Yale 1837, and was for three years a teacher in the N. Y. Institution for the Deaf and Dumb, meanwhile studying theol. in Union Seminary, New York. After some service with the Sunday-school Union, he was pastor of the South Congl. Church, Middletown, Conn., 1844–49; next of the Park St. Church, Boston, 1849–66; then of the First Congl. Church, San Francisco, where, his strength failing 1881, he became pastor emeritus. His grace and power as a preacher gave him wide reputation, and his genial disposition made him hosts of friends. Besides occasional sermons and addresses, he published: *Service the End of Living* (1858); *Ashton's Mothers* (1859); *Memorial Discourses* (1866); *Leaves of a Finished Pastorate* (1882).

STONE, CHARLES P.: soldier: 1826–1887, Jan: 24; b. Greenfield, Mass. He was educated at West Point Milit. Acad., and on graduating was appointed brev. 2d. lieut. of ordnance, 1845, but within a month was made asst. prof. of ethics in the military acad. He was ordered to duty in Mexico 1846, Jan.: in the Mexican war he won the

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brevets of lieut. and capt. for gallant conduct at Molino del Rey and Chapultepec; and was commissioned lieut. 1853. He resigned his commission 1856, and engaged in banking at San Francisco, Cal., then took charge of a survey of Sonora and Lower Cal. for the Mexican govt. Just before the civil war he was called to Washington, re-entered the military service with a captain's commission, and was made inspector-gen. of the Dist. of Columbia militia. He was appointed col. of the 14th regt. U. S. infantry, 1861, May 14, and the same month brig.gen. of vols. In July he served in the Shenandoah valley under Gen. Patterson; after Bull Run he commanded a division of the Army of the Potomac under Gen. McClellan. The disaster suffered by the Federal arms at Ball's Bluff, 1861, Oct., was charged to the rashness of S. in risking a battle without due preparation. He was interrogated by a congressional committee with regard to the causes of the disaster 1862, Jan.; and though his answers seemed to satisfy the committee and to negative the charge of negligence, incompetence, or treachery, S. was arrested, and for seven months was held in close confinement in Fort Lafayette, New York harbor. He was released unconditionally, but without any explanation, and assigned to duty with Gen. Banks, under whom he served at the siege of Port Hudson, and took part in the skirmish at Bayou Teche, and in the battles of Sabine Crossroads and Pleasant Hill, 1864, Apr. 8 and 9. The following Aug. he was appointed to command a brigade in the Army of the Potomac: he resigned his commission after the battle of Petersburg. S. was mining supt. in Va. 1865-69. He entered the military service of the khedive of Egypt, 1870, as chief of staff, and was in effect chief commander of the Egyptian army. The khedive conferred on him the decoration of the Osmanich order 1870, and made him grand officer of the Medjii order 1875: he was raised to the dignity of pasha 1873. He returned to the United States 1883.

STONE, DAVID MARION: editor: b. Oxford, Conn.; 1817, Dec. 23; bro. of Andrew Leete S. He was a teacher at 16 years of age; a merchant in Philadelphia, 1842-49; for a short time editor of the N. Y. *Dry Goods Reporter*; commercial ed. of the *Journal of Commerce*, and, 1861, with William C. Prime, became its co-editor and joint owner, and afterward (1866) its chief editor. For 30 years he was the pres. of the New York Associated Press, and many years financial writer for the *New York Observer*, and for *Hunt's Merchants' Magazine*. The *Journal of Commerce* was suppressed by the U. S. govt. for a while in 1864 for publishing Joseph Howard, Jr.'s, forged proclamation of Pres. Lincoln; this matter was inserted in S.'s absence. He was authority in his specialties of finance and commerce. In his earlier years he cultivated literature, contributing to magazines, and published a very popular book, *Frank Forest* (1849); and *Life and Letters of Mary Elizabeth Hubbell* (1857). He d. 1895, Apr. 2.

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STONE, JAMES KENT: Rom. Cath. priest: b. Boston-1840; son of John S. S., D.D. Graduating at Harvard Coll. 1861, he studied two years in German and Italian universities; then returned home and entered the volunteer military service, but after six months retired on account of wounds. He then became prof. in Kenyon Coll., O.; and later pres. of the institution, having in the mean time been ordained priest in the Prot. Episc. Chh. He was pres. of Hobart Coll. 1868-9. In the latter year he renounced Protestantism, and was admitted into the Rom. Cath. Chh. In 1870 he published *The Invitation Heeded*, giving reasons for his change. He entered the congregation of St. Paul the Apostle, and was ordained priest, but about 1875 became a member of the austere order or congregation of the Passionists (q.v.), and after a few years of labor in conducting religious retreats in the United States, was assigned to missionary work in S. America.

STONE, JOHN HOSKINS: 1745-1804, Oct. 5; b. Charles co., Md. He was chosen capt. in Smallwood's battalion of the Md. line 1776, Jan 2; and in Dec. was promoted col. He served with distinction in the battles of Long Island, White Plains, Princeton, and Germantown; and resigned on account of disability from wounds 1779, Aug. He was gov. of Md. 1794-97.

STONE, JOHN SEELY, D.D.: Prot. Episc. minister: 1795, Oct. 7-1882, Jan. 13; b. Great Barrington, Mass. He graduated at Union Coll. 1823, studied for the ministry, and was ordained priest 1827. He was rector successively of churches in Litchfield, Conn., Frederick City, Md., New Haven, Conn., Boston, Brooklyn, Brookline, Mass., and Philadelphia. He was prof. in the Prot. Episc. Theol. Seminary in Philadelphia 1862-67; then was dean of the theol. school in Cambridge, Mass., till 1875. He belonged to the evangelical school of theological opinion. S. was an impressive pulpit orator. He wrote *Memoirs of Bp. Griswold*; *The Mysteries Opened* (afterward re-written and entitled *Christian Sacraments*); *Christian Sabbath* (re-written and entitled *The Divine Rest*); *The Church Universal* (later title, *The Living Temple*); *The Contrast*; and a *Life of the Rev. Dr. Milnor*.

STONE, PRESERVATION OF: protection of stone structures from injury by atmospheric influences. The mechanical preservation of stone can be effected to a great extent by coating the surface with boiled linseed-oil, or with oil paint: but these methods destroy the crystalline appearance which constitutes the beauty of most natural stones. Many experiments have been tried with certain chemical solutions that are not likely to mar the inherent beauty of a stone: the substances most used are those soluble silicates used in making artificial stone (see **STONE**). The earlier process of Kuhlmann consisted in coating the surface with a soluble silicate of soda or potash, known also as soluble glass, water-glass, and flint liquor. This was applied with a brush, and silification was produced by the silica of the solution entering

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into combination with the lime of the stone; but this took considerable time, so that, on an exposed front, it was liable to be washed off before the proper hardening took place. The later process of Ransome consists in cleaning the surface of the stone from extraneous matter, and then applying alternate solutions of the above alkaline silicate and chloride of calcium, which forms an insoluble silicate of lime in the pores of the stone. This plan has been extensively used in London, Edinburgh, Glasgow, and elsewhere. Ransome's process is indeed practically the only one in use. But the preservation of the British houses of parliament has been the subject of inquiry since this invention was applied to them; and the committee which sat did not discover any preserving agent which they felt justified in proposing. The chemists engaged in this inquiry selected, from a vast number of proposals then made, the following processes, as claiming careful investigation: 1. Application of silicates of the alkalis, in various states of concentration; 2. Applications of silicates, in conjunction with various saline compounds, intended to produce double decomposition; 3. Application of hydrofluoric or hydrosilicic acid, or their saline compounds; 4. Application of phosphoric acid and acid phosphates; 5. Applications of solutions of the alkaline earths, or their bicarbonates, in water.

The commissioners of Central Park, New York, have had the Egyptian obelisk there coated several times with paraffin; but the permanent value of the process is questioned.

STONE, THOMAS: signer of the Amer. Declaration of Independence: 1743-1787, Oct. 5; b. Charles co., Md. He was a lawyer; was delegate to congress 1774 and 5, and strongly favored the setting up of an independent govt. by the colonies, though instructed as a delegate to oppose that measure. He was again in congress 1777 and 83.

STONE, WILLIAM LEETE: author and journalist: 1792, Apr. 20-1884, Aug 15; b. New Paltz, N. Y.; descendent of Gov. Leete of Md. Beginning as printer, he edited papers in central N. Y. and Conn., finally 1821 the New York *Commercial Advertiser*. He originated the plan of congressional emancipation of slaves 1825; was active in aid for the Greeks; was minister to the Hague under Pres. William H. Harrison; was first N. Y. supt. of schools, and discussed the question of the Bible in schools with Abp. Hughes; and was active in religious and benevolent institutions. He died at Saratoga. His publications include *Hist. of the Great Albany Constitutional Convention* (1822); *Letters to J. Q. Adams on Masonry* (1832); *Matthias and His Impositions* (1833); *Maria Monk* (1836); *Ups and Downs*, etc. (1836), a satire on fashion; *Border Wars of the American Revolution* (1837); *Lives of various Indian chiefs*; *Poetry and Hist. of Wyoming* (1864).—His son, WILLIAM L., b. New York, 1835, Apr. 4, graduate of Brown Univ. and Albany Law School, pub. lives of Sir William Johnson, Col. William L. Stone, Gen. Riedesel, and Mrs. Riedesel; *Hist. of N. Y. City* (1872); *Campaign of Gen. Burgoyne* (1877); and edited the *Journal of Capt. Pausch* (1886).

STONE-CHAT—STONE-CUTTING MACHINES.

STONE-CHAT (*Saxicola rubicola*: see **CHAT**): one of the most common of the British *Sylviadæ*, a pretty little bird, rather smaller than the redbreast, black on the upper parts and throat in summer; the breast of dark reddish color; some white on the sides of the neck, wings, and tail. It makes its nest on the ground, or on a low branch.

STONE-CUTTING AND DRESSING MACHINES: apparatus for working stone into desirable forms. Stone is not easily operated on by machinery, because of its brittleness, its unequal hardness, and the natural cracks which frequently impair its solidity. Accordingly, only in some plainer kinds of work have machines entirely superseded hand operations.

Some stones and slates are soft enough to be cut like wood with ordinary toothed saws. Generally, however,

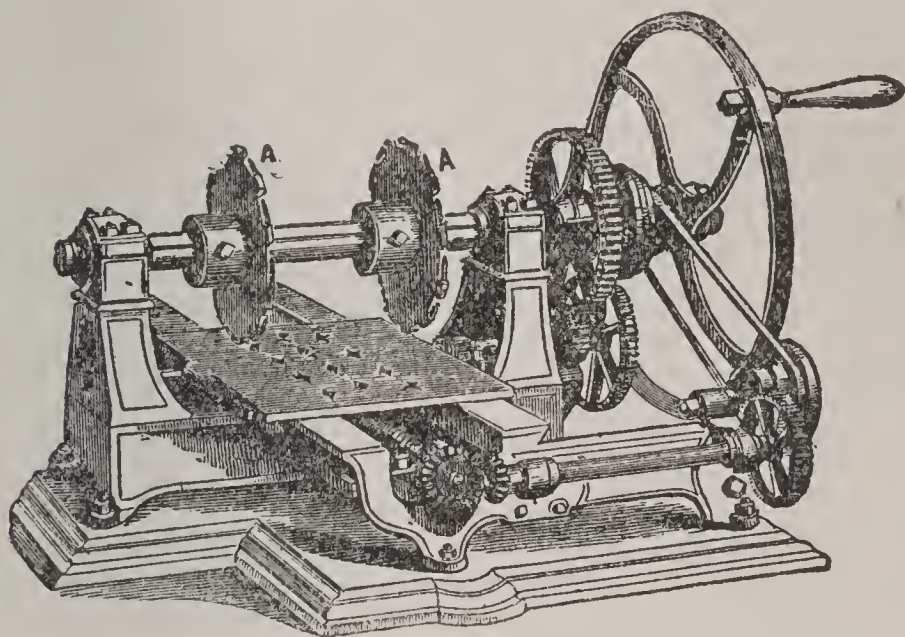


Fig. 1.

the sand-saw is employed (see below, in marble-cutting). For cutting common kinds of stone, which are not to receive fine polish, a machine has been invented whose cutting portion consists (fig. 1) of a circular disc, A, A (two of these are shown in the figure, but the number varies), round whose circumference pointed steel tools are fixed into sockets, giving it the appearance of a large toothed saw. This machine cuts sandstone at the rate of 5 to 6 inches, slate at 3 inches, and soft limestone at 3 inches per minute, supposing these to be in blocks each 2 ft. thick.

For the sawing or slicing of stones the tendency is to use the diamond—the dull black variety which is of no use as a gem. Some American machines whose saws have teeth set with these diamonds are said to cut ordinary sandstone at the rate of 75 sq. ft. per second for each saw. Machines for dressing the face of stones by means of a series of chisels in imitation of the handwork of the mason have given fair results.

Marble is cut into slabs by means of a series of thin

STONE-CUTTING MACHINES.

plates or blades of soft iron used like saws, but having no teeth. The blades are fixed into a rectangular frame, to which a reciprocating horizontal motion is given. The block of marble to be cut rests on a carriage below the frame, and a small rill of mixed sand and water is constantly falling into the saw-cuts. After the marble has been sawn into slabs, it is cut into narrow pieces as required, by small circular saws with smooth edges, sand and water being applied as above.

The sawn slabs are next submitted to the grinding process: this, for pieces of moderate size, is done usually on a large circular cast-iron plate, called a *sanding-bed* or *grinding-bed*, mounted upon an upright spindle, and supplied with sand and water. The workman places the piece of marble with its face downward upon the grinding-bed, and exerts the proper pressure: the marble is held in its place by guide-rods stretched across the plate. Slabs too large to be manipulated in this way are ground with plates of iron operating upon their surface.

The marble when properly ground, is polished on a polishing bed or table, with an arrangement for securely fixing it while the rubbing is being done. The polishing rubbers are sometimes blocks of wood faced with felt, sometimes bunches of hemp compressed between two side-plates: they are attached to a swing-frame with pendulum-like motion, which draws them forward and backward over the surface of the marble. Flour emery is used to charge the rubbers in the first instance, and putty-powder (oxide of tin) for the finishing polish: instead of emery, sometimes a fine-grained stone known as Water of Ayr stone is used to prepare the marble for the putty-powder.

Cylindrical objects, such as columns or vases, are first formed roughly into shape with a hammer and chisel, and then turned, with a pointed steel tool, on a lathe to which a slow motion is given. When thus brought to an accurate form, a rapid motion is given to the lathe, and the tool-marks ground away by the use of coarse, and then fine, and still finer sandstones—the polishing being completed with emery and putty powder while the object is still on the lathe.

Machinery is applied to production also of flat objects with curved and molded outlines. Fig. 2. represents the

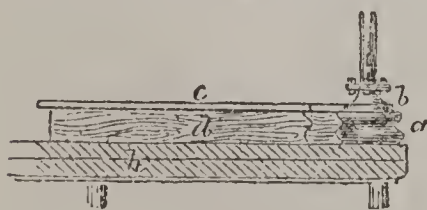


Fig. 2.

essential parts of a machine for this purpose. It operates by the use of a rotatory cutter, guided in its action by a template formed accurately to the intended shape of the article. The cutter, *a*, is of steel or stone, and is attached to the

lower end of a spindle driven by bevelled wheels. There is a flange at *b*, which allows the cutter to penetrate the marble till it reaches the template, *c*, and no further. In the process of cutting, the marble, which we will suppose is to receive the shape shown at S. (fig. 3), but seen only on edge at *d*, in fig. 2, is constantly drawn up against the

STONE-FLY—STONEHAVEN.

cutting-tool by two weights, the one pulling the table, *h* in one direction, the other the carriage on which *h* rests, in a direction at right angles to the former, thus compelling the cutter to follow the outline of the template: the shape of the cutting-tool is, of course, exactly the reverse of the molding to be formed.

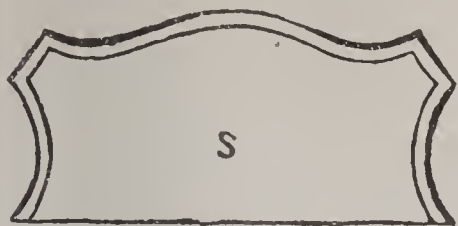


Fig. 3.

In cutting and polishing granite, the machinery and processes are nearly the same as for marble. Objects to which the sawing apparatus cannot be applied must be worked to shape with great care by means of steel chisels and iron mallets, which remove only small portions at a time. As the material is very hard, any defect in the chiselling greatly increases the labor of polishing. So slow, indeed, are the operations with granite, that a saw-blade will not cut through an inch in depth during a whole day, and a good-sized sawn slab requires a week for polishing.

STONE'-FLY (*Perla*): genus of pseudoneuropterous insects, of family *Perlidae*. The hind wings are broader than the fore-wings, and folded at the inner edge. The body is elongate, narrow, and flattened; the wings close horizontally on the body; the abdomen is generally terminated by two long bristles (*setæ*). The larvæ are aquatic, and much resemble the perfect insect, except in lack of wings. A number of species are attractive lure for fishes.

STONE'-FRUITS: popular term for those fruits botanically designated *drupes*, in which the rind is fleshy, and the putamen bony. Many of the finest dessert fruits are of this kind. Those best known in temperate climates generally belong to the nat. order *Rosaceæ*, sub-order *Amygdaleæ* (order *Drupaceæ* of Lindley), e.g., the peach and nectarine, plum, cherry, apricot, etc. In tropical countries, many stone-fruits occur, belonging to *Chrysobalanaceæ* and other nat. orders.

STONEHAM, *stôn'am*: town, Middlesex co., Mass.; on the Lowell system of the Boston and Maine railroad, 12 m. n. from Boston. This prosperous town has several churches, good schools, a free library, two weekly newspapers, and a savings bank. The leading business is the manufacture of shoes and leather; but there are various other industries, including a machine-shop, lumber-mill, and box-factory. Pop. (1870) 4,513; (1880) 4,890; (1890) 6,155; (1900) 6,197.

STONEHAVEN, *stôn-hā'ven*: seaport town in Scotland cap. of the county of Kincardine, on the railway from Dundee to Aberdeen: on a rocky bay at the mouth of Carron Water. It is divided into an Old and New Town, on different sides of the river, connected by a bridge. The harbor admits only small vessels. S. has haddock and herring fisheries.—Two miles s., on a projecting rock, stands the famous castle of Dunnottar, former residence of the Earls Marischal.—Pop. (1881) 3,957; (1891) 4,497.

STONEHENGE.

STONEHENGE, *stōn'hěnj* [Sax. *stanhengist*, nanging or uplifted stones]: very remarkable structure of large artificially raised monoliths, on Salisbury Plain, England, two m. from the town of Amesbury, in Wiltshire, England. The neighborhood abounds in sepulchral tumuli, in many of which ancient British remains have been found. The fabric of S., comparatively entire in the early part of the 19th c., has since been so much defaced as to be at first view little more than a confused pile of moss-grown stones; but a minute inspection can still trace its original form. When entire, it consisted of two concentric circles of upright stones, inclosing two ellipses, the whole surrounded by a double mound and ditch circular in form. Outside the boundary was a single upright stone, and the approach was by an avenue from the n.e., bounded on each side by a mound or ditch. The outer circle consisted of 30 blocks of sandstone, fixed upright at intervals of $3\frac{1}{2}$ ft., and connected at the top by a continuous series of imposts, 16 ft. from the ground. The blocks all were squared and rough-



Stonehenge.

hewn, and the horizontal imposts dove-tailed to each other, and fitted by mortise-holes in their under sides to knobs in the uprights. About 9 ft. within this peristyle was the inner circle, of 30 unhewn granite pillars, 5 to 6 ft. in height. The grandest part of S. was the ellipse inside the circle, formed of 10 or 12 blocks of sandstone, 16 to 22 ft. high, arranged in pairs, each pair separate, and furnished with an impost, so as to form 5 or 6 trilithons. Within these trilithons was the inner ellipse, composed of 19 uprights of granite similar in size to those of the inner circle; and in the cell thus formed was the so-called altar, a large slab of blue marble.

There has been much speculation regarding the origin and purpose of S., but these are still in obscurity. A curious legend, found first in the *British Chronicle* of the 10th c., and repeated by Geoffrey of Monmouth and Giraldus Cambrensis, ascribes it to Emrys or Ambrosius, the last British king, who, in the 5th c., aided by the incantations of the magician Merlin, is said to have erected it in memory of 460 Britons who were murdered by Hengist the Saxon. In modern times, the most prevalent opinion has been that, in common with similar structures elsewhere, it was a temple for Druidical worship; but this belief has been shaken by discovery of the sepulchral

STONEHOUSE—STONINGTON.

character of many other monuments, which also had been presumed Druidical. The circular form has suggested a connection with the worship of the sun; and S. may possibly have been used for the religious rites of successive races and creeds; also as a court of justice or battle-ring for judicial combats. The outer circle is evidently of later date than the rest, and seems to belong to a period when iron tools were in use. See **STANDING STONES**.

STONEHOUSE, EAST: parish of Devonshire, England; included within the parliamentary borough of Devonport (q.v.), and forming in effect a portion of Plymouth (q.v.). Among other govt. establishments, it contains the Royal William Victualling Yard, naval hospital, and marine barracks capable of accommodating 1,000 men. Pop. of parish (1891) 15,083.

STONEMAN, *stōn'man*, **GEORGE**: 1822, Aug. 8—1894, Sep. 5; b. Busti, N. Y.: soldier and gov. of Cal. He graduated at West Point 1846; as second lieut. of the 1st dragoons, he was stationed at Ft. Leavenworth; was quartermaster in Cal. 1847; commanded the post in San Francisco 1848-9; engaged in Indian wars on the coast till 1854; and was made capt., and stationed in Texas 1855. Refusing to surrender govt. property at Ft. Brown to the secessionists 1861, he went to Washington, where he was made brig.gen. and chief of cavalry. He did effective work in pursuing the disunionists after the evacuation of Yorktown; commanded a division at the second battle of Bull Run, and the 3d army corps at Fredericksburg; was promoted maj.gen. 1862; was active in raids as leader of a corps of cavalry in Va. and in the Atlanta campaign; was a prisoner at Andersonville 1864, July-Oct.; commanded the dept. of the Tennessee the same year; did notable service in N. C. 1865; and retired from the regular army 1871. Purchasing a ranch in Los Angeles co., Cal., he was Indian agent, railroad commissioner, and dem. gov. of Cal. 1883-87. He died in Buffalo, 1894, Sept. 5.

STONE RIVER, BATTLE OF: see **MURFREESBORO, BATTLE OF**.

STONINGTON, *stōn'ing-ton*: borough, port of entry, and one of the caps. of New London co., Conn.; on Long Island Sound, and on the New York Providence and Boston railroad; 12 m. e. of New London, 50 m. s.w. of Providence, 62 m. e. of New Haven. It has a capacious harbor with two breakwaters, daily steamboat communication with New York, and seal and whale fishery and coast-trading interests. During the year ending 1890, June 30, the imports at the port were \$12,113; entrances 1 American vessel of 143 tons and 12 foreign vessels of 1,159 tons; clearances 10 foreign vessels of 981 tons; shipping registered, enrolled, and licensed, 109 vessels of 4,832 tons, of which 99 of 4,091 tons were sailing and 10 of 751 tons steam vessels. There are 7 churches, high and graded schools, 1 national bank (cap. \$200,000), 1 savings-bank, and 1 weekly newspaper. The antiquity, quaintness, and charming climate of S. have made it a popular summer resort. Pop. (1880) 7,355; (1890) 7,346; (1900) 8,540.

STONYHURST COLLEGE—STOOL.

STONYHURST COLLEGE, *stōn'î-hérst*: Roman Catholic institution, 7 m. n.e. of Blackburn, Lancashire; founded 1794. It was affiliated to London Univ. 1863; and prepares candidates for matriculation at the universities, and for the civil and military services. It has a staff of about 20 professors and masters.

STON'Y POINT: small rocky promontory on the right bank of the Hudson river, at the entrance of the Highlands, 42 m. n. of New York. This and the opposite Verplanck's Point were fortified in the war of the revolution, and were the scene of several contests.—In 1779, June, under orders from Sir Henry Clinton, Brit. commander-in-chief, Gen. Vaughan took possession of Stony Point (driving a small patriot garrison from a redoubt, called Fayette), fortified it, and garrisoned it with a foot-regt., with some grenadiers and artillery. Gen. Wayne with 550 men was detached to take it. After a hard march through the mountains with the Mass. light infantry, he made a night attack July 16—a portion of his men having volunteered as a 'forlorn hope'—with unloaded muskets, depending on the bayonet. Gen. Wayne was wounded, but insisted on being aided forward with his men; and the storming party under the intrepid Col. Meigs pressed on under heavy fire of grape-shot and musketry, and entered the works. The enemy surrendered, with less than 100 loss of killed and wounded on each side. This has been pronounced one of the most brilliant actions on military records. An assault on Verplanck's Point at the same time having failed, the Americans abandoned and destroyed the fortifications on Stony Point June 18.

STOOD, v. *stúd*: pt. and pp. of **STAND**, which see.

STOOK, n. *stók* [Ger. *stauchen*, to push, to stow: Low Ger. *stuke*, a heap or bunch: Bohem. *stoh*, a heap, a haystack]: in *Scot.*, a number of sheaves of corn set up on end in a field after cutting; 12 sheaves set up: V. to set up sheaves of grain in stooks. **STOOK'ING**, imp. **STOOKED**, pp. *stókt*.

STOOL, n. *stól* [Goth. *stols*; OHG. *stuol*; Dut. *stoel*; Dan. and Sw. *stol*; Icel. *stóll*; Gael. *stòl*; W. *ystól*, a stool, a seat]: small seat without a back; a little form; the seat for evacuating the bowels; the act itself; the evacuations of the bowels. **STOOLS**, n. plu. *stólz*, in a *ship*, small channels in the side to receive the dead-eyes of the back-stays. **WINDOW-STOOL**, flat piece on which the window shuts down. **STOOL-PIGEON**, pigeon used as a decoy.

STOOL, n. *stól* [Manx. *sthol*, a sprout or branch: L. *stolo*, a shoot, a sucker]: stemless mother-plant used for propagation by annually bending its branches into the soil; the root or stump of a timber-tree which throws up shoots; the set or cluster of shoots thus produced: V. to send out suckers. **STOOL'ING**, imp. **STOOLED**, pp. *stóld*.

STOOL OF REPENTANCE: in churches in Scotland, formerly a low stool conspicuously placed in front of the pulpit, on which persons under ecclesiastical censure for

STOOP—STOP.

immoral conduct were required to sit during public worship, in profession of their penitence, or on which they stood at the close of the service to be 'rebuked' by the minister. It was familiarly called the *cutty-stool*, a term applied to small stools of similar form common in houses, but which came to be employed in conversation and in humorous verses with special reference to that which stood in the church. The S. of R., though used in some places within the 19th c., has now been completely disused, as has mostly also the practice of formal public rebuke.

STOOP, v. *stóp* [Low Ger. *stuppen*, to strike the ground with a stick in walking: Dut. *stappen*, to step, to set down the foot: Icel. *steypa*, to cast or throw down: Sw. *stupa*, to incline, to lower]: to bend the body forward; to lean forward in standing or walking; to cause to incline downward, as a cask; to yield; to submit; to condescend; to acknowledge inferiority: to come down on its prey, as a hawk; to alight from the wing: N. inclination forward; condescension; the swoop of a bird, e.g., upon its prey: in *Scot.*, a post fixed in the earth, or a prop: in *N. Y.* [from D. *stoep*] platform with steps downward from a house, usually roofed; porch (sometimes applied improperly to an extensive piazza, veranda, or portico). **STOOP'ING**, imp. **STOOPED**, pp. *stópt*. **STOOP'ER**, n. *-ér*, one who stoops. **STOOP'INGLY**, ad. *-lǐ*.—**SYN.** of 'stoop, v.': to lean; bend; descend; cower; shrink.

STOOP, n. *stóp* [Dut. *stoop*; Icel. *staup*, a flagon or drinking-vessel (see also **STOUP**)]: a drinking-vessel.

STOP, v. *stóp* [Sw. *stoppa*, to stuff, to cram: *Scot.* *stap* to cram: Dut. *stoppen*; Ger. *stopfen*, to stuff: It. *stappare*; mid. L. *stupārē*, to stop up with tow—from L. *stupa*; Gr. *stupē*, tow]: to hinder; to impede or interrupt; to suppress; to render impassable; to close, as an aperture; to regulate the sounds of, as a musical instr., with the fingers; to cease from going forward, or from any course of action; to put an end to any course of action; to leave off, as from work: N. cessation, as of progress, motion, operation, or action; obstruction; hindrance; impediment; obstacle; one of the vent-holes of a musical wind-instr., by the opening or closing of which musical sounds may be regulated and modified (see **STOP**, or **REGISTER**): the place in a stringed instr. pressed on for production of a musical sound: point or mark in writing to distinguish a sentence or part of a sentence, and show the pauses in reading. **STOP'ING**, imp. closing; obstructing. **STOPPED**, pp. *stópt*. **STOP-PAGE**, n. *stóp'pāj*, act or state of stopping or being stopped; an obstruction; discontinuance of work; suspension of payments; deduction from pay to repay advances, etc. **STOP'PER**, n. *-pér*, one who or that which stops; cork or glass mouthpiece for a bottle: V. to close or secure with a stopper. **STOP-cock**, instr. used to regulate the supply of water, gas, etc., flowing through pipes. **STOP-GAP**, something substituted; temporary expedient.—**SYN.** of 'stop, v.': to obstruct; repress; impede; restrain; delay; interrupt; cease; check; intercept.

STOP—STOPPAGE OF PAY.

STOP, or REGISTER: one of the different ranges of pipes in an organ. Each S. consists of a series of pipes of the same quality of tone, extending throughout the whole or a large part of the compass of the instrument, and furnished by a draw-stop or knob, the drawing out of which admits the air to the particular S., so that the keys will play on pipes of that character. Some stops give not the note which corresponds in pitch with the key struck, but a note an octave or two octaves lower, or one of the harmonics higher in pitch. Compound or mixture stops consist of more than one row of pipes to each key, corresponding to the different harmonics of the ground-tone. The stops of different organs vary greatly in number and kind. See ORGAN.

STOPPAGE *in Tran'situ*: valuable right or privilege of a vendor of goods to resume possession, after he has parted with them under a contract of sale, and before the goods have reached the vendee; occurring when goods are consigned entirely or partly on credit from one person to another, and the consignee becomes bankrupt before the goods arrive. In such event, the consignor has a right to direct the capt. of the ship or other carrier to deliver the goods to himself or his agent instead of to the consignee, who has by bankruptcy become unable to pay for them. There are certain circumstances in which the right of S. in T. may be defeated; e.g., when the consignee indorses the bill of lading to a *bona fide* indorsee. When the vendee has appointed the carrier who is to receive the goods, their delivery to the carrier is treated for many purposes as delivery to the vendee himself; yet it is not too late for the vendor to stop the goods so long as they have not come into the actual possession of the vendee. The right of S. in T. is not allowed to a vendor unless in case of the bankruptcy of the vendee or of his stoppage of payment. Undelivered parts of a consignment may be stopped *in transitu*, and this even when the entire lot has been transferred on the books of a public store or warehouse. The right cannot be superseded by an attachment at the suit of a general creditor levied while the goods are in transit; and should the vendor attach the goods himself, he would destroy his right of S. in T. The vendor is held to have surrendered possession when he has actually delivered the goods to the vendee, his agent, or a public store or warehouse designated by the vendee; and he can bring suit for the price of the goods after he has caused them to be stopped in transit and while they are in his possession, provided he is ready to deliver them on payment of the price; and he may also resell them.

STOPPAGE OF PAY, MILITARY AND NAVAL: certain deductions from the pay of officers and men in the Brit. service, in consideration of supplies made to them, or in aid of certain institutions. In the U. S. army and navy the corresponding phrase is 'retained pay.' Officers and men are liable to have a portion of their pay 'retained' by the govt. as a punishment, and in case of desertion and a number of offenses. But the proper application of the phrase 'retained pay' is as follows.—In the *army*, the retention

STOPPLE—STORAX.

of 12½ cts. per month from the pay of an enlisted man, with his consent, gives him the right when old or permanently disabled to be cared for in the National Soldiers' Home as long as he lives. Besides, pay is retained on the following system: In the 1st and 2d year of a 5-year first enlistment no part of the pay is retained, in 3d year \$1, 4th \$2, and 5th \$3 per month. In the first re-enlistment the soldier receives \$2 extra per month and has \$1 per month retained each year. On the honorable discharge of the soldier, the retained pay is paid to him with interest at 4 per cent. per annum. Desertion and a dishonorable discharge forfeits this return. Clothing accounts are settled semi-annually, when balances due the govt. are charged to the soldier on the muster-roll, and balances due the soldier are carried forward on the co. books credited to his current clothing account: any balance due him at his discharge is credited to him in final settlement.—In the *navy*, all enlisted men, except musicians of the band, serving in the first period of 5 years, are entitled to \$1 per month for the 3d year, \$2 for the 4th, and \$3 for the 5th, in addition to the regular rate of pay; and the additional amounts are retained till the expiration of service, and are paid only on final settlement and honorable discharge. All enlisted men, except the marine band, serving under a re-enlistment, have \$1 per month retained and similarly settled; and all enlisted men, except musicians of the band and re-enlisted men, have \$4 per month retained during the first year of their enlistment, the amount being paid with interest at 4 per cent. per annum on honorable discharge. See RATION.

STOPPLE, n. *stōp'pl* [dim. of STOP, which see]: anything put into the mouth or neck of a bottle to stop or close it; a cork; a plug.

STOR'AGE BATTERY: see ELECTRICITY: ELECTRIC LIGHT: ELECTRIC RAILWAY.

STORAX, n. *stō'rāks* [L. *storax*, *styrax*; Gr. *sturax*, a resinous gum]: aromatic resinous substance, obtained from the Storax-tree (*Styrax officinalis*), native of countries around the Mediterranean Sea; belonging to nat. order *Styracaceæ*, order of exogenous plants, containing more than 100 known species. The species are found in tropical and subtropical Asia, extending also into Europe and Africa, and in warm parts of America. In the U. S., from Va. s., in low pine barrens, are three shrubby species, the leaves with some scurf or starry down—*S. pulverulenta* having fragrant flowers. *Styrax officinalis*, which produces S. or Gum-storax, is a tree 15–20 ft. high, native of the Levant. S. is obtained by wounding the bark, when the gum exudes and hardens in the air. It appears in market in the form of reddish-yellow tears about the size of a pea, opaque, soft, and adhesive; or in dry brittle masses, wrapped in the leaves of a kind of reed, when it is called *S. calamita*. S. has fragrant odor and aromatic taste; is stimulating and expectorant; and was formerly much used in medicine. Benzoin (q.v.) is the product of a species of

STORE—STORK.

Styrax.—The *Liquid S.* of the shops is doubtfully regarded as produced either by *Styrax officinale* or by a species of *Liquidambar* (q.v.): it seems probable that there are two kinds.

STORE, n. *stōr* [OF. *estorer*, to build, to furnish; *estoire*, provisions—from mid. L. *staurum*, store—from L. *instaurāre*, to repair, to restore—in mid. L. to provide or store with: comp. Gael. *stor*, riches]: large quantity; abundance; quantity accumulated; a hoard; any shop where a miscellaneous assortment of goods is sold. STORES, n. plu. *stōrz*, the necessary supplies provided; in the *army* or *navy*, a supply of provisions, clothing, etc., or of arms, ammunition, etc.: V. to supply or furnish with stores; to lay up; to hoard. STOR'ING, imp. STORED, pp. *stōrd*. STORER, n. *stōr'ēr*, one who stores. STOR'AGE, n. -*āj*, act of laying up in a store or warehouse; price paid for safe-keeping of goods. STOREHOUSE, house expressly for safe-keeping of grain or goods; a magazine; a repository. STOREKEEPER, one who has the care of a store. STOREROOM, room in which things are stored. STORE-SHIP, vessel employed to transport stores for a fleet or for a garrison, etc. IN STORE, laid up for future use; in a state of preparation for future use.—SYN. of 'store, n.': fund; supply; plenty; accumulation; provision; magazine; warehouse.

STOREY, n. *stō'rī*, plu. STOREYS, *stō'rīz*: another spelling of STORY 2, which see.

STOREY, *stō'rī*, WILBUR FISK: journalist: 1819, Dec. 19—1884, Oct. 29; b. Salisbury, Vt. He was a journeyman printer at the age of 12, and worked in the office of the *Middlebury Free Press* 5 years. After two years in New York, he started a newspaper in La Porte, Ind.: that enterprise failed, and he kept a drug-store, and then began the study of law in Jackson, Mich. Here, too, he founded a newspaper, which he soon sold, having been appointed postmaster. On losing the post-office 1849, he again opened a drug store, but soon quit that business—having been elected to the state constitutional convention; later he was made prison inspector. He bought an interest in the *Detroit Free Press* 1853, and before long was editor and sole owner. Removing to Chicago 1861, he bought the *Times*, which under his management attained an immense circulation. 'Circulation' was the end at which S. aimed, and he appears to have held all means right that led thither.

STORIED, *stō'rīd*: see STORY 2 and 3.

STORK, n. *stōrk* [Dut. *stork*; Icel. *storkr*; Dan. *stork*, a stork: Fris. *staurke*, to strut]. (*Ciconia*): genus of birds of the same family (*Ardeidæ*) with herons and bitterns; large birds, with long legs, four-toed, the three front toes webbed to the first joint; tail short; wings large; bill longer than the head, straight, strong, pointed, and without any groove, nostrils pierced longitudinally in the horny substance; eyes surrounded by naked skin. In some storks the whole face and throat are destitute of feathers. The species are not numerous (about a dozen), but of very wide geographic distribution. The COMMON

STORK.

S., or WHITE S. (*C. alba*), is native of the greater part of the old world, a migratory bird, its range extending even to n. Scandinavia. It is common in most parts of Europe, but is especially familiar in Holland and n. Germany. The storks arrive annually in Feb. and Mar., and in autumn return to Africa in large flocks, flying mostly by night. The S. is about three and a half ft. long. The head, neck, and whole body are pure white; wings partly black; bill and legs red. The neck is long, and generally carried in an arched form; the feathers of the breast are long and pendulous, and the bird often has its bill half hidden among them. The flight is very powerful and high in the air; the gait slow, stalking, and measured. In flight the



Storks and Nests.

head is thrown back and the legs are extended. The S. sleeps standing on one leg, with neck folded, and head turned backward on the shoulder. It frequents marshy places, feeding on eels and other fishes, frogs, lizards, snakes, slugs, young birds, small mammals, and insects. It makes a rude nest of sticks, reeds, etc., on the tops of tall trees, or of ruins, spires, or houses. There are four or five eggs, white tinged with buff; and the old nest is reoccupied next year. In many parts of Europe, especially in Holland, it is a very common practice to place boxes for

STORK'S-BILL--STORM.

storks, and it is considered a fortunate thing for a household that the box on the roof is occupied. Storks are protected by law in some countries, for their services not only in destroying reptiles and other troublesome animals, but in removal of offal from the streets of towns, in which they stalk about with perfect confidence, even amid throngs of people. They have been celebrated from ancient times for their affection for their young; and have also had the reputation—not so well founded—of showing great regard to their aged parents. Before they take their departure from their summer haunts, they congregate in large flocks, which make a great noise by the clattering of their mandibles, and are popularly regarded as holding consultation. The S. has no voice. It is very rare in Britain, and was so even before the fens of England were drained. The flesh of the S. is rank, and not fit for food.—Another species, the BLACK S. (*C. nigra*), rather smaller, plumage of the upper parts glossy black, under parts white, is common in many parts of Europe, Asia, and Africa.—The AMERICAN S. (*C. Americana*) is very similar to the Common Stork; it is common in S. America, particularly Brazil.

STORK'S-BILL: plant, named from the beak-like character of the fructification; genus *Erodium*, ord. *Geraniaceæ*.

STORM, n. *staworm* [Dut. *storm*, a rustling, a rattling: Icel. *stormr*, tempest, sedition: Ger. *sturm*, a storm: Gael. *stoirm* and *toirm*, noise]: violent outburst of one or more of the elements, wind, rain, snow, thunder and lightning (see STORMS): any violent commotion; tumultuous force; a tumult: a violent and determined assault on a fortified place: V. to attack, or attempt to take, by open force, as a fortress; to blow with violence; to rage; to be loudly angry. STORM'ING, imp.: N. the taking of a fortified place by a violent and open assault. STORMED, pp. *stawormd*. STORMY, a. *staworm'i*, tempestuous; boisterous; violent. STORM'INESS, n. *-nēs*, the state of being stormy; tempestuousness. STORM'ILY, ad. *-lī*. STORM-LIKE, a. like a storm, or having the appearance of a storm. STORM-BEAT, a. impaired by the violence of a storm. STORMY-PETREL, small black-sea-bird often seen flying swiftly in the wake of a ship before or during a storm, called also 'Mother Carey's chicken.' STORM-SAIL, coarse, stronger sort of sail for gales. STORM-TOSSED, a. beaten about by storms. STORM-WINDOW, outer window to protect the inner from the effects of storms, and to preserve warmth in winter. STORMING-PARTY, party of soldiers having assigned to them the duty of first entering the breach in storming a fortress. STORM-STEAD, or STORM-STAYED, hindered or delayed in a journey from the necessity of remaining under shelter owing to the inclemency of the weather. STORM IN A TEA-CUP or -POT, much noise about little or nothing.—SYN. of 'storm, n.': tempest; hurricane; calamity; agitation; violence, tumult; clamor; distress; adversity.

STORMS.

STORMS: term from the root of *stir*, signify properly, not every fall of rain or snow, but more or less violent disturbances of the atmosphere, usually producing rain, snow, or hail, and often thunder and lightning. A storm is more than a passing gust, and, when extreme, is called a tempest.

There are local S., and the more extensive or regional S. In the tropics occur the typical local S.; that is, such are local in cause, though the same conditions may produce similar phenomena over a wide region. They are the diurnal thunder storms, coming punctually a while after noon, though the morning may be cloudless, and are due to the large ascent of moist heated air, resulting in heavy precipitation from the chilling effect of the higher atmosphere. Similar local storms, with thunder, may occur in hot weather in the temperate zones, usually later in the day; sometimes on the prairies they continue all night with incessant lightning; but they are often connected with a wide area of barometric depression, with either the possibility or the neighboring actuality of an extensive cyclonic storm. Sometimes the local or the more general storm is violent but rainless, and is then known as a wind-storm, or dust-storm, and the word is even applied to violent disturbances of the magnetic needle, called magnetic S., often interfering with telegraphic communication, and referred to solar disturbances.

Atmospheric S., even when local, n. of the tropics and trade-wind belt, tend to move easterly in the n. hemisphere, in accordance with the general movement of winds; and are frequently developed over bodies of water or along water-courses, where evaporation is greatest. Stormy conditions have been seen to manifest themselves lightly just e. of the Rocky Mts., but to increase speedily and powerfully in their progress a little further e. toward the moister Miss. valley. A local storm is perhaps best distinguished from those due to extensive cyclonic conditions by the absence of succeeding cold w. winds, which attend such conditions; it is often remarked that the weather is even more oppressive after the local S. In contrast with these summer phenomena are the 'northers' of the cooler seasons of the year, when, perhaps for days, there is a down-rush of cold wind (with or without snow) from the n. central parts of the continent, due apparently to disturbed equilibrium over a wide extent southward.

The great cyclonic S. (see CYCLONE) are developed first in the tropics or warmer zones, and proceed n. and e. along the n. Gulf streams of the Atlantic and Pacific oceans, or strike into continents from the Gulf of Mexico and the Indian Ocean. Ours are probably from the Pacific, reinforced or re-developed e. of the Rocky Mts., when from the west; or from the Gulf of Mexico, or from the W. Indies, impinging on the Atlantic states.

In n. and central Europe, S. pursue the same general n.e. direction. As the weather-maps of the U. S. signal service are publicly posted at many points, we subjoin for comparison, and for illustration, a chart of Europe, show-

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ing, from actual observations at more than 100 localities on that continent, the barometric pressure, and direction and force of the wind, 1863, Nov. 1, at 8 A.M., during

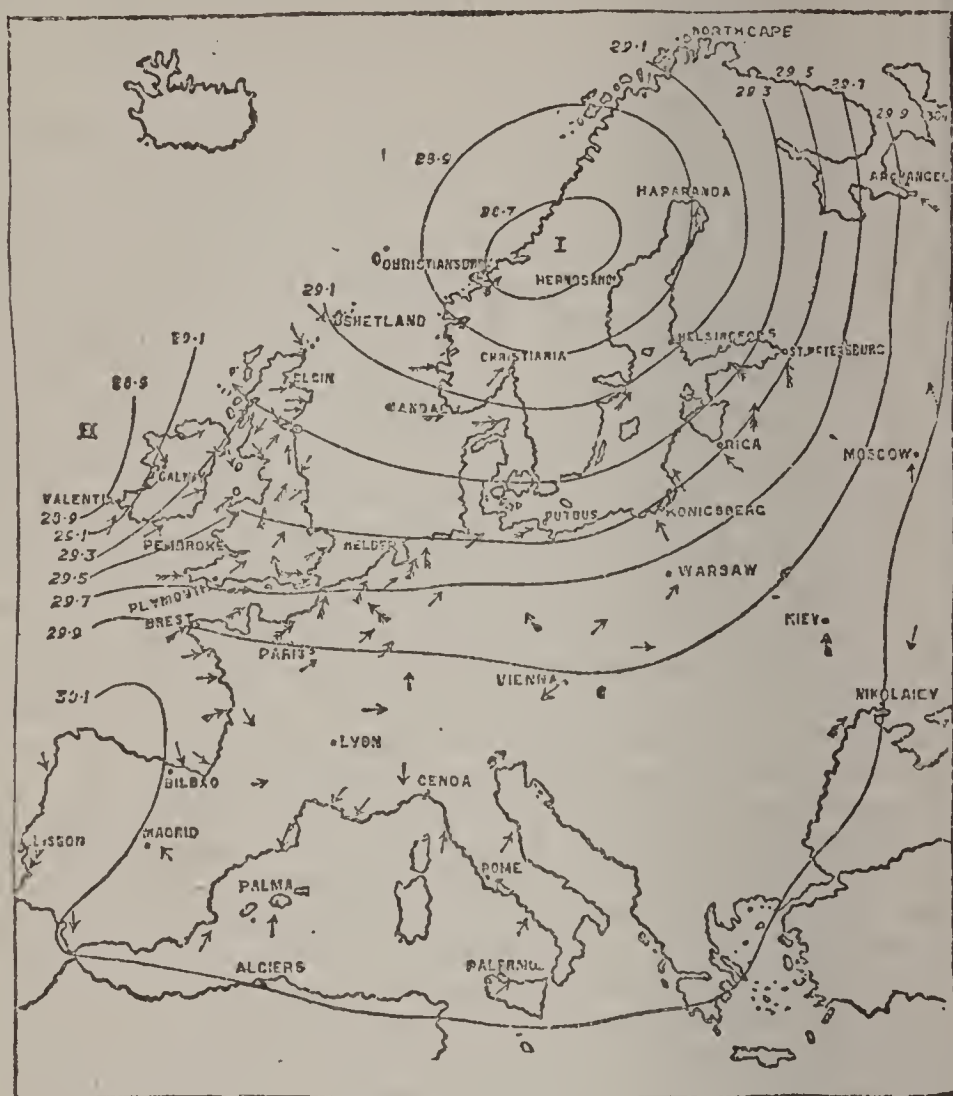


Fig. 1.—At 8 A.M., November 1, 1863.

part of the course of a storm which passed over Europe at that time. The isobarmetric lines, or lines showing where, at the above hours, the height of the barometer was the same, are given for every two-tenths in the difference of the pressure. Hence, where these lines approach near each other, or crowd together, the difference of pressure, or the atmospheric disturbance, was greatest; and the least where they are most apart—a distinction of utmost importance in determining where the storm may be expected to rage in greatest fury. The arrows show the direction of the wind, being represented flying with it. The force of the wind is shown (1) by plain arrows, which represent light and moderate winds; (2) by arrows feathered on one side only, which represent high winds; (3) by arrows feathered on both sides, which represent strong gales, storms, or hurricanes.

The mean atmospheric pressure, at the level of the sea, may be stated at 29.9 inches. When, therefore, the barometer falls below 29.9, the equilibrium of the atmosphere

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is more or less destroyed according to the amount of the fall, and it is within this *area of low barometer* that a storm may be expected to occur. Hence, while we trace these low pressures, as they advance over the earth's surface from day to day, we trace at the same time the progress of the storms.

The circular isobarometric lines on the charts represent the general shape which S. assume. The area of almost every storm is either circular or elliptical, and when elliptical, the major axis of the ellipse seldom exceeds twice the length of the minor axis. Rarely in Europe, but in America less rarely, the form of storms is much more elongated. The outline is occasionally very irregular, but in such cases the storm tends to part into two or more distinct S., which remain separate for some time and perhaps then reunite. This circular form of S., which an examination of hundreds, especially in Europe, has shown

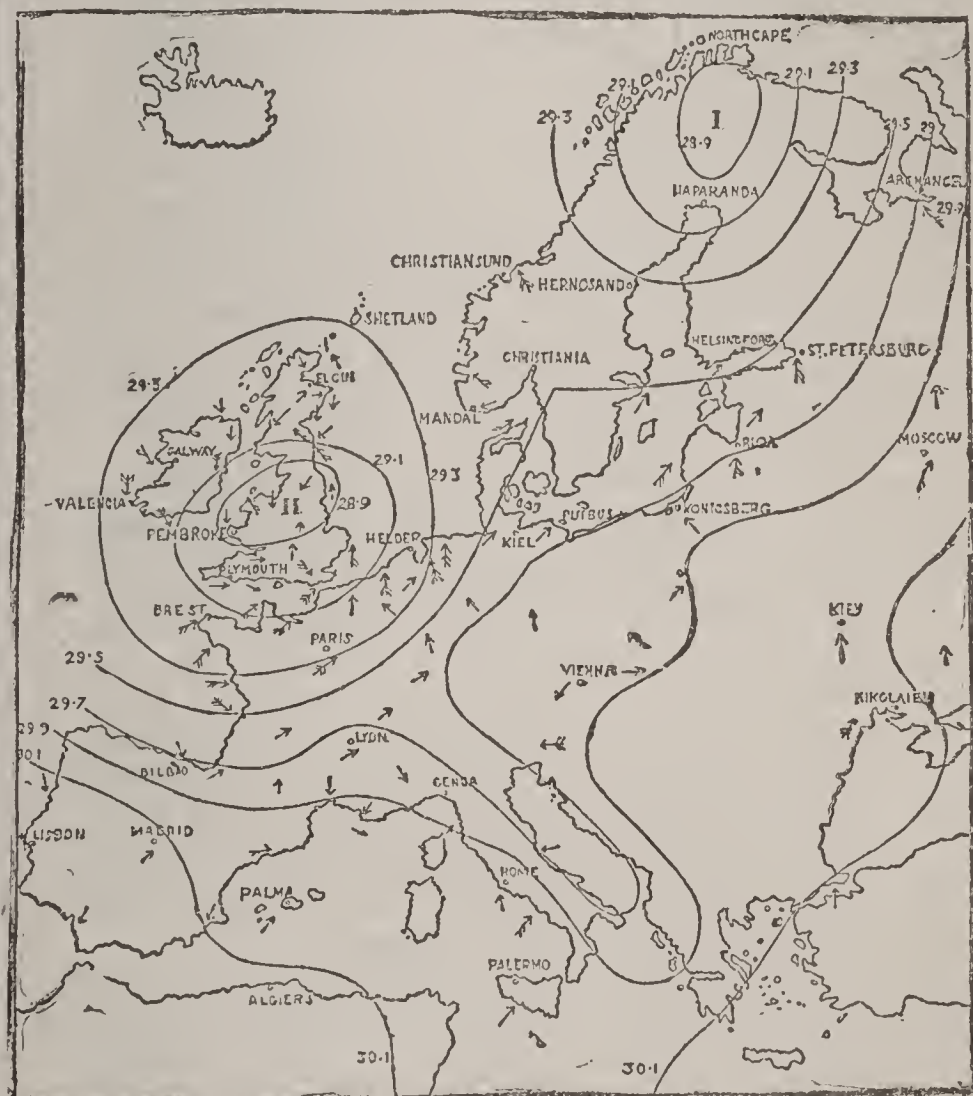


Fig. 2.—At 8 A.M., November 2, 1863.

to be their general characteristic, is a most important feature, whether as determining the practical rules for the guidance of sailors in S., or for the forecasting of S. at particular seaports, in regard to the direction from which they may be expected, and the veerings of the winds dur-

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ing their continuance. The extent over which S. spread themselves is very variable, being seldom less than 600 m. in diameter, but often two or three times that amount, or even more. Almost the whole of Europe is sometimes overspread by a single storm at one time. The area of S. is not constant from day to day; but varies in size, sometimes expanding and sometimes contracting. And it is worthy of remark, that usually when a storm contracts its area, the central depression gives signs of filling up, and the storm of dying out. On the other hand, when it increases in extent, the central depression may become deeper; the storm increases in violence, and occasionally is broken up into two, or even three, depressions, which become separate S., with the wind circling round each.

By the *direction* of a storm is meant, not the direction of the wind, but the path followed by the centre of disturbance. The direction in which their progressive motion takes place differs in different parts of the world—being probably determined by the prevailing winds: see WINDS. Thus, about half the S. of middle and n. Europe travel from s.w. toward the n.e.; and 19 out of every 20, at least, travel toward some point in the quadrant from the n.e. to the s.e. S. do not always proceed in the same uniform direction from day to day; and though the change in the direction of their progressive motion is usually small, yet occasionally it is very great. Many of the S. of the Mediterranean proceed from the n. to the s., influenced probably by the heated air rising from the Sahara; a considerable number proceed from the e., and pass w. over Greece and Italy to the Alps; and a very few are observed to travel easterly.

The S. of the W. Indies generally take their rise near the region of calms, and tracing out a parabolic course, proceed first toward the n.w., and then turn to the n.e. about 30° n. lat., many of them traversing the e. coasts of N. America as far as Nova Scotia. South of the equator they follow an opposite course. Thus, in the south Atlantic and Indian Ocean, they first proceed s.w., and then gradually curve round to the s.e. The hurricanes of Hindustan usually pursue a parabolic path, first traversing the e. coast toward Calcutta, and then turning n.w. up the valley of the Ganges. The typhoons of the Chinese seas resemble, in their course, the hurricanes of the W. Indies. Observations are lacking from other parts of the world to determine the course of storms.

The New York storm known as the 'Blizzard' of 1888, Monday, March 12, is an example of extreme conditions which may recur, and threatened to repeat themselves once at least in 1891. The accompanying map gives the conditions precedent on Sunday, the 11th. The areas marked 'low' are storm centres. On the same map is shown, in lines of crosses and circles, the progress of the centre of the storm, from just s. of San Francisco on the 7th, until it disappeared off Nova Scotia on the 14th. It was at Colorado Springs on the 8th, 10 p.m. (as indicated by X below the circle); and, a little e. of there, it lingered and apparent-

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ly divided in the night, one branch of the storm proceeding n.e. to the great lakes, while the other moved through the southern states, the centre arriving near Wilmington, N. C., on the 11th, 3 p.m. Between this hour and 10 p.m.



(when the centre was off Norfolk, Va.) the two storms—the other centred between lakes Ontario and Huron at 7 A.M. as on map—appear to have been drawn together, the latter joining the former, which centred off New York at

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7 A.M. on the 12th, the snow having begun seven hours previously as result of the cold following the northern branch-storm. At 3 and 10 P.M. and also on the 13th at 7 A.M. the storm-centre was almost stationary, moving slightly w. from Martha's Vineyard to R. I., as shown by three intersecting circles: the opinion is that it was held back by the 'banking up' of dense air (in other words the persistent position of an anti-cyclone) over the Gulf of St. Lawrence. The resistance gave way, so that on the 14th the cyclone had rapidly moved its centre to the e. of Nova Scotia, apparently veering into that peninsula, however, before it disappeared over the Atlantic. The junction of two storms (the northern one bringing severe cold, 8° Fahr. in New York, with great snow-fall, high winds, and arrest of all travel, traffic, and business for days), and the nearly stationary position of the storm in the vicinity of New York two days, are the remarkable facts. On the map, the many local signs of wind and weather are omitted as confusing on so small a scale. An interesting contrast to the conditions above described are those, e.g., of 1891, Nov. 23, 8 A.M., when the barometer was as low as 29.2 at Columbus, O., the centre of a great rain-storm (but with slight fall in many places) extending from the Gulf of St. Lawrence to the Gulf of Mexico, and throughout the states as far w. as a line from w. Io. to Mobile. From Corpus Christi, Tex., to Lexington, Ky., a remarkable wedge of cold entered this area, producing snow in Tenn. It probably swept around and dipped down from a cold centre (-10°) n. of N. Dak., extending southward. The centre of another anti-cyclone was advancing from Astoria, Or. An instance of uniform conditions occurred 1891, Dec. 12, when the chief feature was a great oval of high barometer extending e. and w. through all the central portions of the United States, accompanying a week of fine weather.

The average rate of the progressive movement of European S. is not far from 16 to 18 m. an hour. They travel with less velocity over the ocean than over land. Within the tropics, the onward motion of storms sometimes rises to 40 m. an hour; at other times the rate of motion is so slow as to be almost stationary.

The temperature increases at places toward which and over which the front part of the storm is advancing, and falls at those places over which the front part of the storm has already passed—i.e., the temperature rises as the barometer falls, and falls as the barometer rises. When the barometer has been falling for some time, clouds begin to overspread the sky, and rain to fall at intervals; as the central depression approaches, the rain becomes more general, heavy and continuous, and corresponding to the atmospheric depression at the place where it falls. After the centre of the storm has passed, or when the barometer has begun to rise, the rain becomes less heavy, falling more in showers than continuously; the clouds break up, and fine weather, ushered in with cold breezes, ultimately prevails. If the temperature begins to rise soon and

markedly after the storm has passed, a second storm may be expected shortly, except in the case of local storms.

As to the direction of the winds in a storm, in the n. hemisphere they will be observed whirling round the area of low barometer in a circular manner, and in a direction contrary to the motion of the hands of a watch, with—and be this particularly noted—a constant tendency to turn toward the centre of lowest barometer. The wind in storms neither blows round the centre of lowest pressure in circles, nor does it blow directly toward that centre, but takes a direction nearly intermediate, approaching, however, nearer to the direction and course of the circular curves than of the radii to the centre. The greater the force of the wind is at any place, it will be observed to approach the more nearly the direction here indicated. And where the direction of the wind differs to any material degree from this general law, it is light, and consequently more under local influences, which turn it from its course. The winds circulate round the centre of least pressure, or, more accurately, the whole atmospheric system flows in on the centre in a spiral course. In the s. hemisphere, also, a rotatory motion is observed round the centre of S., but in a contrary direction, or in the direction of the motion of the hands of a watch.

Next, as to the force of the wind: The rule is simple, and without exception—viz., the wind blows from a high to a low barometer, and with a force proportioned to the difference of the barometric pressures. Hence, where the isobarometric lines crowd together, the violence of the storm is most felt, and where they are far asunder, the winds are moderate and light. We thus see the importance of observations from a distance in forecasting the weather. As the wind nears the centre of the storm, it gradually abates, till on reaching the centre a lull or calm follows. Calms and light winds also prevail along the ridge of highest barometer, or the region where the pressure is greatest.

The rotatory velocity of the wind round the centre of the storm, in Europe and America, frequently amounts to 60 or 80 miles an hour continuously for some time. In intermittent gusts, a speed of 100 miles an hour has been several times observed.—See METEOROLOGY: CLOUDS: WIND: RAIN: SNOW: HAIL: LIGHTNING: CYCLONE: TORNADO: BAROMETER: ETC.

STORNELLO-VERSES, *stôr-ně'l' lô*- [It. dim. of *storno*, a thrusting or turning aside]: poetical verses in which the same word or words are frequently repeated and harped upon.

STOR'NOWAY: see LEWIS-WITH-HARRIS.

STORRS, *stôrz*, CHARLES BACKUS, D.D.: 1794, May 15—1833, Sep. 15; b. Longmeadow, Mass.; bro. of Dr. Richard Salter S. (1787–1873). After three years at Princeton Coll., he studied theol. in Bridgehampton, L. I., graduating at Andover Theol. Seminary 1820. He did missionary work in S. C. and Ga., was pastor at Ravenna, O., 1822–28, and prof. of theol. and the first pres. of Western Reserve Coll., from 1831 till his death.

STORRS.

STORRS, HENRY MARTYN, D.D., LL.D.: 1827—1894, Dec. 1: theologian; b. Ravenna, O.; son of Dr. Charles Backus S. He graduated at Amherst 1846, and at Andover Theol. Seminary; was pastor in Lawrence, Mass., 1852—55, Cincinnati, O., 1855—67, and of the South Congl. Chh., Brooklyn, N. Y., 1867—72; and was corr. sec. of the Amer. Home Missionary Soc., New York, 1872—82, and 1882 till his death pastor of the First Presb Chh., Orange, N. J. He published various articles, sermons, and addresses. He was sent as delegate to the Congregational Union in England, where his addresses made great impression. He delivered one of the courses of lectures in the Lyman Beecher lectureship in the Divinity School of Yale University.

STORRS, RICHARD SALTER, D.D., LL.D.: 1787, Feb. 6.—1873, Aug. 11; b. Longmeadow, Mass.: Congl. minister. His father, Richard Salter S., was pastor in his native place, and his grandfather, John S., was chaplain in the revolution. He was educated in part at Yale, graduating at Williams Coll. 1807. After studying theol. with the Rev. Aaron Woodworth of Bridgehampton, L. I., he preached in Islip and Smithtown, L. I.; graduated at Andover 1810, and was pastor in Braintree, Mass., until his death. From 1817—25 he edited the *Boston Recorder*, and was one of the editors of the *Congregationalist* 1850—56. He was noted for spiritual fervor and intellectual ability; and was one of the leaders in his denomination. Besides numerous sermons and contributions to periodicals, he published *Memoir of Rev. Samuel Green* (1836), and *Life and Letters of Rev. Daniel Temple* (1855).

STORRS, RICHARD SALTER, D.D., LL.D., L.H.D.: Congl. minister and orator: b. Braintree, Mass., 1821, Aug. 21; son of the Rev. Dr. Richard Salter S. (1787—1873). He graduated at Amherst Coll. in the class of 1839, which numbered Bp. Huntington, Father Hewitt, and others of note. After teaching in Munson and Williston Academies (Mass.), he studied law in Boston with Rufus Choate, but turned to theol., graduating at Andover 1845. A year's pastorate of the Harvard Church (Congl.), Brookline, Mass., was followed by acceptance of a call 1846 to the then new Church of the Pilgrims (Congl.), Brooklyn, N. Y., whose pulpit he still fills with unabated grace and power. For many years he has been an extemporaneous preacher, and as such is among the foremost in this country. With large learning and superlative culture, he is characterized especially by richness and magnificence of thought that naturally utters itself in splendor of diction. He was associate editor of the *Independent* 1848—61: since 1873 pres. of the Long Island Hist. Soc., and 1887—1897 of the American Board of Missions. He received the degree D.D. from Union Coll. and from Harvard Univ.; LL.D. from Princeton; L.H.D. from Columbia. He has been a constant contributor to the press, but his separate publications have been volumes of lectures, and occasional addresses and orations. Of the lectures are those on *The Wisdom, Power, and Goodness of God, as manifested in the Constitution of the Human Soul* (1856); *Conditions of Success in Preaching without*

STORTHING—STORY.

Notes (1875); and *The Divine Origin of Christianity* (1881), given at Union Theol. Seminary, New York, and before the Lowell Institute, Boston. Among the addresses are, *Appeal of Romans to Educated Protestants* (1873); *Early American Spirit and the Genesis of It* (1875); *Declaration of Independence and the Effects of It* (1876), New York Centennial oration; *Recognition of the Supernatural in Life and Letters* (1881), Φ B K oration; *Manliness of the Scholar* (1883); *Divine Origin of Christianity indicated by Its Historical Effects* (1884); *The Prospective Advance of Christian Missions* (1885); *Forty Years of Pastoral Life* (1886); *The Broader Range and Outlook of the Modern College Training* (1887); and *The Puritan Spirit* (1890). He died 1900, June 5.

STORTHING, n. *størt'ing* [Dan. *stor*, great; *thing*, a court]: the legislative assembly of Norway (q.v.). Its members are elected by certain deputies, who, in their turn, are chosen by a constituency comprising every native Norwegian of 25 years of age who is a burgess of any town, or possesses property in land to the value of \$160, the qualification for being elected, if 30 years of age, being the same. When the S. is in session, every member is paid an allowance equivalent to about \$3.25 per day. When elected, the S. meets of its own authority without writ from the king, and divides itself into two chambers, the *Lagthing* and the *Odelsting*, the former composed of one-fourth, the latter of the remaining three-fourths of the members. Since 1869 the sittings have been annual.

STORY, *stō'ry*, JOSEPH, LL.D.: renowned jurist and judge: 1779, Sep. 18—1845, Sep. 10; b. Marblehead, Mass.; son of a member of the Boston tea-party, who was also surgeon in the revolutionary army. He was educated at Harvard College, and admitted to the bar 1801. Having early given attention to literature and poetry, he published, 1804, *The Power of Solitude*, and other poems—a volume which he afterward regarded as a youthful mistake. Elected to the state legislature 1805, he became the leader in Mass. of the republican, or, as it was afterward called, the democratic party; though in national politics his later views were largely those of Washington and Hamilton. In 1808 he was elected to congress, where he gave moderate support to the war measures of Pres. Madison, who, however, 1811, appointed him associate justice of the supreme court of the United States, his age being only 32 years. In admiralty, salvage, insurance, and prize law, also in patent law—departments till then ill-defined—his decisions did much to create the law as now administered. With Chancellor Kent, S. founded the U. S. equity jurisprudence; and with Chief-justice Marshall he developed the full constitutional powers of the U. S. supreme court. In 1829 he became law prof. at Harvard, and removed his residence to Cambridge. Under S., the Harvard Law School immediately rose to be one of the chief seats of legal learning. His genial and merry disposition, with his frank and familiar manner, joined with his great erudition to make him a favorite with his students.

On his election as one of the overseers of Harvard Coll.

STORY—STOT.

1818, that univ. conferred on him the degree LL.D., and later he received the same honor from Brown and from Dartmouth.—Besides the works on laws and constitutions named above, S. wrote several legal text-books—among them, *Commentaries on Equity Jurisprudence*, noteworthy as the first systematic treatise on that subject, and volumes on *Equity Pleadings*, on the law of *Agency*, of *Partnership*, of *Bills of Exchange*, and of *Promissory Notes*. Two vols. of *Miscellaneous Writings* contain selections from his discourses and essays on literary, historical, political, and other questions. He left in MS. a voluminous *Digest of Law*. See *Life*, by his son, William W. Story.

STORY, n., or STOREY, n. *stō'ri*, STO'RIES and STO'REYS, n. plu. *-rīz* [probably from OF. *estorer*, to construct, to build (see STORE)]: a single stage or floor of a high building; a division of a house reached by one flight of stairs; a flat. STO'RIED, a. *-rīd*, having stages or floors reached by flights of stairs, as two-storied.

STORY, n. *stō'ri*, plu. STO'RIES, *-rīz* [F. *histoire*, history—from L. *historia*, relation]. narration of a series of facts or incidents; written narrative of events; history: a short or trifling tale: a fiction: a falsehood; a fib: V. in *OE.*, to tell after the manner of history; to narrate. STO'RIED, a. *-rīd*, told or recited in history; adorned with historical paintings. STORY-BOOK, a book containing entertaining narratives, either true or merely fiction. STORY-TELLER, a relater of stories; a teller of falsehoods. STORY-TELLING, the habit or amusement of telling stories; the act of fibbing.

STORY, WILLIAM WETMORE, D.C.L.: sculptor: b. Salem, Mass., 1819, Feb. 12; son of Judge Joseph S. He graduated at Harvard 1838, and from the law dept. 1840. He published U. S. First Circuit Reports 1842-47; *Treatise on the Law of Contracts Not under Seal* (1844); *Treatise on the Sale of Personal Property* (1847); he wrote also verse and literary prose. After 1848 he applied himself to art, residing in Rome, where he was an academy professor. Among his works are a statue of his father at Mt. Auburn, of Edward Everett in Boston, of George Peabody in London and Baltimore; and ideal statues, especially of famous women of antiquity, such as the *Cleopatra* and *Semiramis* in the New York Metropolitan Museum. He published *Life and Letters of Joseph Story* (1851); *The American Question* (1862); *Roba di Roma* (1862); *Proportions of the Human Figure* (1866); *Graffiti d'Italia* (1869); *The Roman Lawyer in Jerusalem* (1870); *Tragedy of Nero* (1875); *Castle of St. Angelo* (1877); *He and She: a Poet's Portfolio* (1883); *Fiammetta* (1885); *Poems* (1856, and 2 vols. 1886); *Conversations in a Studio* (1890). He d. 1895, Oct. 7.

STOT, n. *stōt* [see STOAT: Sw. *stut*, a bull]: in *Scot.*, a young bullock or steer; in *OE.*, a stallion.

STOTHARD—STOUGHTON.

STOTHARD, *stōth'ērd*, THOMAS, R.A.: designer and subject-painter: 1755, Aug. 17—1834, Apr. 27; b. London; son of an inn-keeper, who kept the *Black Horse* in Long Acre. He received a respectable education in boarding-schools; and on his father's death, having shown taste for art, was bound apprentice to a pattern-drawer, but was released from his engagement and betook himself to more artistic work. His first notable effort was a series of designs for the *Town and Country Magazine*, followed by his imaginative compositions for Bell's *British Poets* and the *Novelist's Magazine*. The popularity of these was so great that for many years his services were constantly in request by the leading publishers in London. His earliest pictures at the Royal Acad. were *The Holy Family*, and *Ajax Defending the Body of Patroclus*. In 1791 he was chosen an associate, 1794 a member, and 1813 librarian of the acad. He died in London. S. was an admirable and facile illustrator. His designs have been estimated to number 5,000; and about 3,000 have been engraved; but his paintings, though gracefully 'composed' and finely colored, lack the originality that accompanies a study of nature, and resemble enlarged 'illustrations' for books. In the tragic and heroic, his success was not great. Perhaps the best known and most agreeable of his sets of illustrations is *Canterbury Pilgrims* 1817; others are the *Flitch of Bacon*, the *Fête Champêtre*, and the paintings executed for the staircase at Burleigh, seat of the Marquis of Exeter.—See Mrs. Bray's *Life of Thomas Stothard, R.A., with Numerous Illustrations from his Works* (1851).—His son, CHARLES ALFRED S. (1786–1821), acquired great reputation as antiquarian draughtsman.

STOUGHTON, *stō'ton*, ISRAEL: born in England; d. 1645. He removed to Mass., becoming a citizen of Dorchester 1633, was a member of the general court 1634–37, meanwhile published a political pamphlet which for a time made him unpopular, was prominent in the expedition against the Pequot tribe 1637, and afterward commanded an artillery company. For several years he was assistant gov. of Mass., was practically the gov. of N. H. 1641, was in England 1642–44, returning in the latter year, was lieutenant of a prominent regt., and was a benefactor of Harvard College. He died in England.

STOUGHTON, WILLIAM: 1632, May 30—1701, July 7; b. England: preacher and civilian official. He studied theol. in the Mass. colony at Harvard Coll.; was fellow of Oxford Univ.; returned to the colony 1662; was Mass. colonial agent in Eng. 1677–79; member of Gov. Andros's council, and of the council of safety that deposed the gov.; was lieutenant-gov. 1692 (until his death), and from the same year chief-justice of the superior court; and acting gov. 1695. As judge he justified always his condemnation of witches. As occasional preacher he was in high esteem. He gave £1,000 to Harvard Coll. and a legacy of land; hence Stoughton Hall 1698, rebuilt 1805. He died in Dorchester.

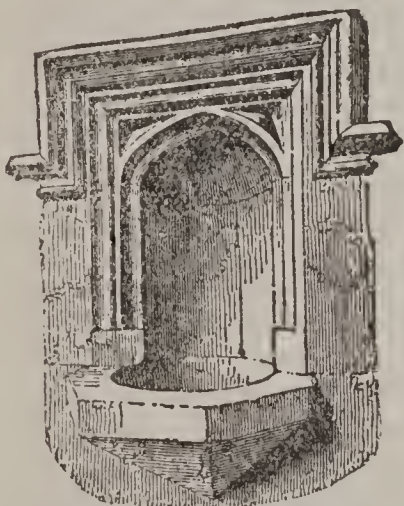
STOUGHTON—STOUTHRIEFF.

STOUGH'TON, **WILLIAM LEWIS**: lawyer: 1827, Mar. 20—1888, June 6; b. New York. In early life he went to Mich., studied law, began practice 1851, became public prosecutor 1854, and was appointed U. S. district attorney 1861, but soon resigned to become lieut.col. of a Mich. regt. of Union vols. He served at various points in the w. and s., and lost one of his limbs at the battle of Ruff's Station. He was brevetted brig.gen. and maj.gen. vols., was atty.gen. of Mich. 1866, and member of congress 1869-73. He died at Sturgis, Michigan.

STOUND, v. *stownd* [Dan. and Sw. *stund*, a space of time: Scot. *stound*, a sharp pain affecting one at intervals]: in *OE.*, to be in pain or sorrow: N. a sudden severe pain or grief; a pang; in *OE.*, noise; astonishment; time; season.

STOUND, *stownd*: for **ASTOUND**, which see.

STOUP, or **STOOP**, n. *stóp*, in Scot. *stowp* [Dut. *stoop*; Ger. *stauf*; Icel. *staup*, a flagon or drinking-vessel: Gael. *stòp* and *stuiþ*, a wooden vessel for holding liquor]: a flagon; a basin for holy water at the entrance of a Rom. Cath. Church. **STOUP**, n. *stowp*, in Scot., a measure or vessel for liquids.



Stoup, Maidstone Church, Kent.

STOUR, n. *stôr* [OF. *estour*, dust: AS. *styrian*, to stir]: in *OE.*, an assault; a tumult; in Scot., dust in a state of motion.

STOURBRIDGE, *stûr'brîj*: market-town in the county of Worcester, England; 20 m. n.n.e. of the town of Worcester, 10 m. w. of Birmingham; on the left bank of the

Stour. It contains iron-works and glass, earthenware, and fire-brick factories. 'Stourbridge clay,' on which the action of fire has less effect than on most varieties of clay, is an article of export: glass-house pots, crucibles, etc., are made of it. Pop. (1871) 9,376; (1881) 9,757; (1891) 9,386.

STOUT, a. *stowt* [OF. *estout*; Low Ger. *stolt*; O. Dut. *stout*, stout, rash: Ger. *stolz*, proud]: lusty; corpulent; robust; strong; intrepid; valiant: N. strong porter. **STOUT'LY**, ad. -*lî*. **STOUT'NESS**, n. -*nês*, the condition of being stout; strength; courage; bulkiness; corpulence; in *OE.*, obstinacy; stubbornness. **STOUT-BUILT**, or **STOUT-MADE**, a. having a strong frame of body. **STOUT-HEARTED**, a. brave.—**SYN.** of 'stoutness': bulkiness; strength; bulk; valor; force; courage; lustiness; brawniness; boldness; fortitude.

STOUTHRIEFF, *stowth'rĕf*, in Scottish Law: robbery in a dwelling-house.

STOVE—STOW.

STOVE, *n.* *stōv* [Icel. *stofa*, a stove, a bath: *Ō. Dut.* and *Low Ger.* *stove*, a stove: *It.* *stufa*; *OF.* *estuve*, a stove, a hot bath]: inclosed fireplace, or structure of iron or other material, in which fuel may be burned for heating an apartment, or for cooking (see **WARMING AND VENTILATION: HYPOCAUST: FUEL: COMBUSTION**): in *hort.*, hothouse; room or space artificially warmed (see **BARK-STOVE: DRY STOVE**): *V.* to heat or dry, as in a stove: in *Scot.*, to cook; to stew. **STO'VING**, *imp.* **STOVED**, *pp.* *stōvd*.

STOVE, *v.* *stōv* [*pt.* of **STAVE**, which see]: broken or burst in, as a hole in a ship.

STOVER, *n.* *stō'vēr* [*OF.* *estover*, necessities, provisions]: fodder for cattle; straw or coarse hay.

STOW, *v.* *stō* [*Dan.* *stuve*; *Dut.* *stouwen*; *Ger.* *stauen*, to thrust wares together in packing: *L.* *stīpārē*, to pack together: *Gr.* *steibein*, to tread tight]: to place; to lay up; to arrange and pack. **STOW'ING**, *imp.* **STOWED**, *pp.* *stōd*. **STOWAGE**, *n.* *stō'āj*, act or operation of laying compactly; room for being laid up; money paid for stowing goods. **STOW'AWAY**, *n.* *-ā-wā*, one who conceals himself on board an outgoing vessel to secure a free passage.

STOW, *v.* *stow* [*Sw.* *stuf*; *Low Ger.* *stuw*, a remnant]: in *prov. Eng.* and *Scot.*, to lop or top trees.

STOW, *stō*, **JOHN**: one of the earliest and most diligent of English antiquaries: 1525–1605, Apr. 6; b. London. He was brought up to his father's trade of tailor in Cornhill, but abandoned it for antiquarian pursuits. Writing 1575, he says: 'It is now ten years since I, seeing the confused order of our late English chronicles, and the ignorant handling of ancient affairs, leaving mine own peculiar gains, consecrated myself to the search of our famous antiquities'—a patriotic sacrifice, which ought to have brought him from his king and country an old age of ease and honor, but which brought him only want and beggary. However, he was cheerful in his poverty. In his 79th year, S. obtained letters patent from James I. authorizing him to become a mendicant, or, as it is expressed in the state document, 'to collect amongst our loving subjects their voluntary contributions and kind gratuities.' He died soon afterward, and was buried in the parish church of St. Andrew Undershaft, in Aldgate Ward, where his monument of terra-cotta, erected by his widow, may still be seen. S.'s antiquarian researches caused his collection of what the ecclesiastical authorities called 'many dangerous and superstitious books;' and Grindal, Bp. of London, searched his premises for books 'in defense of papistry;' but S. seems to have proved his Protestant soundness. The principal works of S. are: *Summary of Englische Chronicles*, 1561, subsequently reprinted every two or three years, with continuation to the date of each new publication; *Annales, etc., of England*, 1580, reprinted 1592, 1601, 05, with continuation to the last year; and *A Survey of London*, 1598, the most important of his writings. Besides these original works, S. assisted in the continuation of Holinshed's Chronicle, Speght's ed. of Chaucer, Leland's

STOW—STOWE.

Collectanea, etc. He had collected or transcribed a vast number of MSS., and much valuable information which might otherwise have perished; and in the use of his stores he was liberal to others, while as an original historian he was faithful and impartial.

STOW, *stō*, or STOKE, *stōk* [A.S. *stoc*, a stockaded place]: component element in many names of places, e.g., Bristow or Bristol, Stockholm.

STOWE, *stō*, CALVIN ELLIS, D.D.: 1802, Apr. 6—1866, Aug. 22; b. Natick, Mass.: educator and biblical scholar. Lacking financial means, he was assisted to gain an education; graduated at Bowdoin Coll.; finished his theol. studies at Andover Theol. Seminary 1828, and was subsequently an assistant there of Prof. Moses Stuart, meanwhile doing editorial work for the Boston *Recorder*. He was prof. of languages in Dartmouth Coll. 1830, and prof. of biblical lit. in Lane Theol. Seminary, Cincinnati, 1830–50. He did much to promote the common-school system in Ohio, and, after visiting Europe, published a widely distributed state report on *Elementary Education in Europe*, followed by two reports on elementary education in Prussia, and one on education of immigrants. He became prof. of divinity in Bowdoin Coll. 1850; and of sacred lit. in Andover Theol. Seminary 1852, which position he held until his resignation on account of failing health 1864, when he removed to Hartford, Conn., the place of his death. He married Harriet E. Beecher Stowe (his second wife) 1836. He had an active and fertile mind, and as a scholar and occasional preacher he had wide recognition. While in the theol. seminary, he translated Jahn's *Hebrew Commonwealth*; and while editor, Lowth's *Lectures on the Sacred Poetry of the Hebrews* (1829). He published, besides addresses and many review articles, *Introduction to the Criticism and Interpretation of the Bible* (1835), and the *Origin and Hist. of the Books of the Bible*, including Apocrypha (1867).

STOWE, HARRIET ELIZABETH (BEECHER): authoress: b. Litchfield, Conn., 1812, June 14; 3d daughter and 6th child of Lyman Beecher, D.D. (q.v.), and wife of Prof. Calvin E. S., D.D. (q.v.), whom she married 1836. Her early education, stimulated by the intellectual atmosphere of her home, was pursued at Litchfield Acad., and, from her 13th year, at Hartford, where she continued until 1832. As a child she became interested in poetry, theology, and reform, anti-slavery especially; and showed much ability in prose and poetic composition, and acquisition of languages. At the age of 14 she was engaged with her elder sister, Catherine, as teacher in a girls' school in Hartford, having a class in Butler's *Analogy*. After her marriage she was much affected by the anti-negro riots in Cincinnati. She became a frequent contributor to periodicals, published some stories in a volume entitled *The May-flower* (1849), and other spirited juvenile stories for Sunday-school libraries. The ability of Mrs. S. as a delineator of character, especially New England character, was known

STOWELL.

to many; but her full power was not suspected until, 1851, she began in *The National Era*, anti-slavery paper at Washington, a serial tale, *Uncle Tom's Cabin*. When completed 1852, it was published at Boston; and its popularity was so immense that it soon sold in four stereotype editions to the extent of 400,000 copies. The English reprints are estimated to have circulated 500,000; and it was rapidly translated into all European and some Asiatic languages, no less than 20 in all, and was extensively dramatized and illustrated. In 1853 she published a *Key to Uncle Tom's Cabin*, and visited Europe, where she was received with distinguished consideration. The events and impressions of this triumphant tour are recorded in her *Sunny Memories of Foreign Lands* (2 vols. Bost. 1854). In 1856 she published *Dred: a Tale of the Dismal Swamp*, another anti-slavery story, which had wide circulation. This was followed 1859 by *The Minister's Wooing*, a story of New England life in the 18th c.; etc. In 1869 Mrs. S. contributed to *Macmillan's Magazine* an article entitled *The True Story of Lady Byron's Life*—some statements in which, impugning the character of Lord Byron, called forth stormy criticism, and occasioned her reply (1870), *Lady Byron Vindicated*. Mrs. S. was 1868–70 joint-editor of *Hearth and Home*. She contributed to the *Independent* and other journals. Her other publications include: *The Pearl of Orr's Island*, and *Agnes of Sorrento* (1862); *The Ravages of a Carpet*, and *House and Home Papers* (1864); *Religious Poems, Stories about Dogs*, and *Little Foxes* (1865); *The Chimney Corner* (1868); *Men of Our Times* (1868); *Old-Town Folks* (1869); *Pink and White Tyranny*, and *Sam Lawson's Fireside Stories* (1871); *My Wife and I* (1872); *Palmetto Leaves* (1873); *We and Our Neighbors* (1875); *Footsteps of the Master* (1876); *Bible Heroines*, and *Poganuc People* (1878); *Queer Little People* (1881). She died at Hartford, Conn., 1896, July 1.

STOWELL, stō'el, WILLIAM SCOTT, D.C.L., Lord: one of the most eminent of English judges: 1745, Oct. 17—1836, Jan. 28; b. Heworth, Durham; eldest brother of Lord Chancellor Eldon (q.v.); and son of a tradesman in coal. He was educated at Newcastle; entered Corpus Christi, Oxford, 1761, and became a college tutor. In 1779 he took the degree D.C.L., removed to London, was called to the bar (1780) and admitted to the faculty of advocates at Doctors' Commons. Dr. Johnson introduced him to the Literary Club, and he became well known in the most intellectual society of London. As an advocate he at once obtained large practice, and his promotion was rapid. In 1788 he was appointed judge in the consistory court, knighted, and nominated a privy councilor. In 1798 he became judge of the high court of admiralty, the highest dignity in his branch of the profession. Both as ecclesiastical and as admiralty judge he won high distinction. He wrote no systematic treatise or text-book, but his judgments were admirably reported, and fully evince his extensive legal learning, his sagacity, and his great literary ability. He is the highest English authority on

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ecclesiastical law and on international law; and his decisions are at least presumptive evidence of international law in the United States. His judgments—those, especially, relating to the rights of belligerents and neutrals—have been described as the most valuable contribution by an English judge to general jurisprudence since the time of Lord Mansfield. As a politician S. was not remarkable. He represented Oxford in the house of commons 20 years, but took no part in the business of parliament, though, like his brother, he was a zealous supporter of the conservative party and the established church. At the coronation of George IV. he was raised to the peerage under the title Baron S. of Stowell Park. In 1827 he retired from the bench, with gradually failing mental faculties,

STOWMARKET, *stō'mâr-kět*: small market-town of Suffolk, England; on the Gipping, navigable to S.; 12 m. n.w. of Ipswich. Iron, leather, paper, and gun-cotton are manufactured. Pop. (1881) 4,052; (1891) 5,304.

STRABANE, *strá-bân'*: market-town, county Tyrone, Ireland; on the river Mourne; 130 m. n.n.w. from Dublin, with which it communicates by railway. It communicates with Londonderry, and thus with the sea, by canal and river. The chief industry is connected with the linen trade, and there is a valuable fishery. S. has 1 Prot. Episc., 2 Presb., 2 Meth., and 1 Rom. Cath. churches. Pop. (1891) 5,013.

STRABISMUS, n. *stră-biz'mŭs* [Gr. *strabismos*, a squinting; *strabos*, squinting—from *strephō*, I turn]: in *med.*, squinting; a defect of vision in which both eyes cannot be directed to the same object: see SQUINTING.

STRABO, *stră'bō*: famous ancient geographer and historian: b. prob. between B.C. 64 and 62, in Amasea in Pontus; date of death unknown, but after A.D. 20. By the mother's side he was of Greek descent, and connected with the Mithradatidæ (see MITHRADATES): of his father or his father's family nothing is known. How the name Strabo ('squint-eyed') must have originated is obvious, but whether any of the family were so called before him is uncertain. S. was well educated under the grammarians Tyrannio of Amisus in Pontus, and Aristodemus of Nysa in Caria, and the philosopher Xenarchus of Seleucia in Cilicia. He does not appear to have followed any professional calling, but to have spent his life in travel and study, from which it is inferred that he had wealth, or at least considerable means. He was at Corinth B.C. 29; in Egypt B.C. 24, and ascended the Nile; at Rome after A.D. 14, and was still writing A.D. 21. It is conjectured that he died at Rome. S.'s *Geography* is a work of great value in those parts especially which record the results of his own extensive observation. 'Westward,' he says in a passage in the 2d book, 'I have travelled from Armenia to the parts of Tyrrhenia adjacent to Sardinia; toward the south, from the Euxine to the borders of Ethiopia. And perhaps there is not one among those who have written

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geographies who has visited more places than I have between these limits.' Yet it must not be supposed that he describes with equal accuracy or fulness all the countries of whose geography he treats. Some he seems to have visited hurriedly, or in passing elsewhither; others he knows like a native. Thus, his accounts of Greece, particularly the Peloponnesus, are very meagre, and of many of the obscurer regions he writes chiefly from hearsay. He makes copious use of his predecessors, Eratosthenes, Artemidorus, Polybius, Posidonius, Aristotle, Theopompus, Thucydides, Aristobulus, and many other writers now lost to us; but he strangely depreciates the authority of Herodotus, and quotes few Roman writers except Fabius Pictor and Julius Cæsar. His *Historical Memoirs* and *Continuation of Polybius* are lost. His *Geography* is in that department the first known work, and the most important left us from antiquity. Its historical notices, though incidental, are valuable and interesting. He accepts the Homeric geographical scheme. The work comprises 17 books, of which the first two are introductory, the next eight are devoted to Europe, the six following to Asia, and the last to Africa. The style is pure and simple. The *editio princeps* of S. appeared at Venice 1516; a notable recent one is that by Müller and Dübner (2 vols. 1853-57).

STRABOMETER, n. *stra-bŏm'ĕ-tĕr* [Gr. *strabos*, squinting; *metron*, measure]: in *surg.*, an instrument for measuring the want of concordance of the optic axes. **STRABOTOME**, n. *strā'bo-tŏm*, knife for operating for strabismus. **STRABOTOMY**, n. *stra-bŏt'o-mĭ* [Gr. *strabos*, squinting; *tomē*, a cutting]: operation for the cure of squinting by cutting the muscle or muscles that distort the eyeball.

STRACHEY, WILLIAM: colonist: b. England, 1585. With Sir Thomas Gates he sailed in the *Sea Venture* 1609, and was wrecked on the Bermudas, but the following year was taken to Va. in a boat made from the wreck. S. was sec. of the Va. colony 1610-12, and compiled for its use a work entitled *Laws Divine, Morall, and Martiall*. He also wrote *A True Repertory of the Wracke and Redemption of Sir Thomas Gates upon and from the Islands of the Bermudas*, and a *Historie of Travaile into Virginia Brittania*.

STRADDLE, v. *strād'dl* [Dut. *strijden*; Ger. *streiten*; Icel. *stríða*, to contend, to oppose: Dan. *stride*, to set the feet apart for the purpose of resistance]: to place one's self astride; to stand or walk with the legs far apart; to walk wide and awkwardly: N. the act of standing, sitting, or walking with feet unusually far apart; the distance between the feet of one who straddles. **STRAD'DLING**, imp. *-dling*: **ADJ.** standing or walking with the legs unusually far apart. **STRADDLED**, pp. *strād'dld*.

STRADELLA, *strá-dĕl'lá*: city of n. Italy, 10 m. s.e. of Pavia: pop. 7,000.

STRADEL'LA, ALESSANDRO: Italian musical composer and singer, in the last half of the 17th c.; famous both for his influence on the music of his country, and for his

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tragic history. His birth at Naples 1645, long the accepted account, cannot be verified. His works, which consist of numerous airs, duets, cantatas, madrigals, 6 oratorios, and 11 operas, show extraordinary genius, and contributed largely to form the taste of succeeding composers, particularly Purcell, Clari, Steffani, and Alessandro Scarlatti. S. was renowned for his exquisite voice and polished manner; and when engaged in Venice, instructing Ortensia, a young lady of rank, mistress of a Venetian noble, the musician and his pupil became mutually enamored, and fled to Rome. They were traced thither by two bravos whom the Venetian employed to kill S., and who were prepared to assassinate him in the church of San Giovanni Laterano, where S. was conducting an oratorio which he had just composed; and both assassins, it is said, were so captivated with his voice that they abandoned their object and betrayed to him the plot. Pursued by other bravos, headed by Ortensia's father, to Turin, S. was stabbed, but not mortally, when lodged in the palace of the Duchess of Savoy. Thereupon S. married Ortensia; and went to Genoa, where about a year later (1678, or perhaps soon after 1681) he and his wife were mortally stabbed in their bedchamber by the emissaries of their unrelenting persecutor. See Bonnet-Bourdelot's *Histoire de la Musique et de ses Effets* (Paris 1715).—At the Biblioteca Palatina in Modena are 148 musical MSS. of S.: others are in the Brit. Museum, and in the library of Christ-Church, Oxford. The beautiful *Pietà Signore*, frequently printed and ascribed to S., cannot be verified as his composition.

STRADIVARIUS, *strá-dē-vá'rē-ús* (or STRADIVARI *strá-dē-vá'rē*), ANTONIO: famed violin-maker of Cremona 1649–1737. S. was pupil of Amati: his best violins, made 1700–25, settled the Cremona pattern: see VIOLIN.

STRAFFORD, *stráf'ërd*, THOMAS WENTWORTH, EARL of: 1593, Apr. 13—1641, May 12; b. London; eldest son of Sir W. Wentworth of Wentworth, Woodhouse, Yorkshire. He was educated at St. John's, Cambridge. In 1611 he was knighted, and married Lady Margaret Clifford, eldest daughter of the Earl of Cumberland. After her death 1622 he was twice married. Subsequently he was chosen member of parliament for the county of York. Soon after his re-election to parliament for Yorkshire 1631, he took up his residence in London. Slighted by the Duke of Buckingham, who then ruled the court and cabinet of Charles I., Wentworth signalized himself as an opposer of the administration. In 1626 he was made sheriff of his county, with the view of preventing him from attending parliament. So resolutely did he oppose the arbitrary royal loan exacted in the following year, that the government deemed it advisable to put him in prison. But Buckingham was little aware of the energy of his opponent. S., having obtained his release, came to the following parliament, resolved to make his power felt both by king and minister. He spoke eloquently on the question of grievances, and was conspicuous in obtaining

the royal assent to the Petition of Right. He was obviously a man worth gaining; and his patriotism, if it had any genuine element, was, unhappily, not strong enough to withstand the temptation now held out to his personal ambition. With his elevation to the peerage, as Baron Wentworth, 1628, he seems not only to have lost all solicitude for popular liberty, but openly to have become its most determined enemy. As pres. of the 'Council of the North,' he appears to have abused his powers, not only for political purposes, but often only to gratify his pride. The legality of the jurisdiction exercised by the council, created by Henry VIII., was very doubtful; and interdicts against it were at various times applied for from the courts at Westminster. S. declared openly that he would 'lay by the heels' any judge presuming to interdict the council from exercise of such powers as he chose to hold that it possessed. Nevertheless, this was done by Judge Vernon. In 1631 S. was made deputy of Ireland, and 1639 Earl of Strafford and lord lieut. of Ireland. According to his views, that country belonged to the crown by right of conquest; and neither the natives, nor the descendants of the conquerors themselves, had any rights which could interfere with its sovereignty. Not showing unkindness to the Irish personally, S.'s theory of government for Ireland was to make the nation English Protestants by high-handed force. His rule was of despotic violence, but the administration of justice, in ordinary cases, was prompt and vigorous. Outrage was suppressed, and commerce flourished under his strong hand; and he did much to purify the corrupt English official administration in Ireland. Understanding fully the feelings, policy, and resources of the party to which he had originally belonged, S. had matured a vast political scheme, to which, in his confidential correspondence, he gave the expressive name 'Thorough.' His object was to do in England what Richelieu was doing in France—to make Charles as absolute as any continental monarch; to put the estates and personal liberty of the whole people at the disposal of the crown; to deprive the courts of law of all independent authority; and to punish with merciless severity all who murmured against the government, or who applied to any tribunal for relief from its despotism. He urged the king to invade Scotland, with the advice to meet any resistance in England to this step by bringing over the army from Ireland. This advice proved fatal to S. Happily, the people of England were too strong for him. On his entering the house of peers, on the meeting of the Long Parliament 1640, the message from the house of commons was called in, and Pym, in the name of the commons of England, impeached 'Thomas, Earl of Strafford,' of high treason. This course was afterward abandoned, and the commons proceeded by bill of attainder, which passed the house 1641, Apr. 21, and immediately afterward passed in the house of lords; and received the royal assent under fear of a popular tumult. S. certainly merited his fate, but nothing can excuse the cowardice of

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the king. The earl was beheaded on Tower Hill. 'The attainder was reversed in the reign of Charles II., and his son succeeded to the honors.—See Hallam's *Constitutional History*; Macaulay's *History of England*.

STRAGGLE, v. *sträg'gl* [a derivative of STRAY, which see]: to move irregularly in varying directions; to separate from the regular line of march; to rove; to shoot or extend too far, as the branches of a tree. STRAG'GLING, imp. -*gling*: ADJ. wandering; roving; ranging loose; outlying; standing apart. STRAGGLED, pp. *sträg'gld*. STRAG'GLER, n. -*glér*, one who wanders from the regular line of march, or from his companions; a wanderer.

STRAIGHT, a. *strät* [Ger. *strecken*, to stretch: Dan. *stræk*, a stretch (see STRETCH)]: being in a right line; direct; not crooked; upright: AD. immediately; directly; in a direct line. STRAIGHT'LY, ad. -*lŷ*, not crookedly; tightly; closely. STRAIGHT'NESS, n. -*nēs*, the quality or state of being straight; rectitude. STRAIGHTEN, v. *strät'n*, to make straight. STRAIGHT'ENING, imp. -*nŷng*. STRAIGHTENED, pp. *strät'nd*. STRAIGHTENER, n. *strät'nér*, that which straightens. STRAIGHTFOR'WARD, a. proceeding in a straight course; not deviating. STRAIGHTFOR'WARDNESS, n. direction in a straight course; undeviating rectitude. STRAIGHT'-WAY, ad. -*wä*, or -WAYS, -*wäz*, in a straight or direct manner; immediately; without delay. STRAIGHT-EDGE, a strip of wood or metal with at least one side perfectly straight, for ascertaining whether a surface is even. STRAIGHT-LINED, a. having or consisting of straight lines. TO GO STRAIGHT, to act honestly.

STRAIKS, n. plu. *sträks* [from Eng. *streak*: Dan. *streg*, a stripe, a line]: plates of iron placed over the joints of the felly of a cannon-wheel.

STRAIN, v. *strān* [OF. *estraindre*, to strain—from L. *stringĕrĕ*, to squeeze, to wring]: to extend with great effort; to injure or weaken by stretching or overtasking; to put to the utmost strength, to make straight or tense; to make violent efforts; to make uneasy or unnatural; to constrain; to sprain; to force; to press or squeeze, as in an embrace; to purify by passing through a filter or some porous substance; to filter: N. a violent effort; an injury by excessive exertion; the force exerted on a substance tending to cause it to rupture or break (see STRENGTH OF MATERIALS): continued manner of speaking or writing; a song; part of a tune; one of the periods into which a musical composition is divided by double bars—the strain being further subdivided into periods, sections, phrases, and feet: manner of speech or action; tendency. STRAIN'ING, imp.: ADJ. making great efforts; filtering: N. the act of putting to the utmost stretch; the act of filtering. STRAINED, pp. *strānd*: ADJ. stretched; filtered. STRAIN'ER, n. -*ér*, a filter for liquids. STRAINING-PIECE, in *building*, a piece of timber to keep apart other two pieces. A STRAINING FOR EFFECT, a forced attempt to produce a sensation. TO STRAIN AT A GNAT AND SWALLOW A CAMEL, to make a great ado about small sins while condoning great ones.

STRAIN—STRALSUND.

STRAIN, n. *strān* [AS. *strynan*, to acquire, to procreate, *strynd*, stock: prov. Eng. *strene*, shoot of a tree, progeny]: race; blood; breeding; character; tendency; hereditary disposition; in *Scot.*, resemblance of the features, as, he has a *strain* of his grandfather—that is, he resembles him.

STRAIT, a. *strāt* [OF. *estreit*, narrow—from L. *strictus*, drawn tight; *stringere*, to draw tight]: narrow; confined; not broad; close; difficult; rigorous; avaricious: N. a narrow passage of water between two seas or oceans; distress; difficulty—often in the plu.: V. in *OE.*, to put to difficulties.

STRAIT'LY, ad. *-lī*, narrowly; closely; strictly. **STRAIT'NESS**, n. *-nēs*, the state or quality of being strait; narrowness; want; scarcity.

STRAIT-LACED, a. stiff; constrained; scrupulous. **STRAIT-JACKET**, or **STRAIT-WAISTCOAT**, a contrivance for confining the arms of a lunatic or violent person. **STRAITEN**, v. *strāt'n*, to contract: to confine; to make tight; to deprive of necessary room; to press with poverty or other necessity; to press or perplex. **STRAIT'ENING**, imp. *-ning*. **STRAITENED**, pp. *strāt'nd*.

STRAITS SETTLEMENTS: collective British settlements in the Straits of Malacca, comprising Singapore (q.v.), Malacca (q.v.), and the Prince of Wales Island (q.v.), or Penang, including the province of Wellesley: 1,350 sq. m.: see **MALAY ARCHIPELAGO**: **MALAY PENINSULA**: ETC. The S. S. were transferred from the control of the Indian govt. to the Brit. colonial sec. 1867. The seat of govt. is at Singapore. Pop. (1881) 390,000; (1901) 572,249.

STRAKE, n. *strāk* [a form of **STREAK**, which see]: a narrow board or plank; the tire or iron band of a wheel; in *ship-building*, the term for a line of planking extending from the stem to the stern.

STRAKOSCH, *strāk'ōsh*, **MAURICE**: impressario and pianist: 1825, Jan. 15—1887, Oct. 9; b. Butshowitz, Moravia. Having already achieved reputation in Europe as pianist, he visited the United States 1848. Soon afterward he organized an opera troupe, and thenceforward applied himself to operatic management. He wrote many compositions for the piano which attained much popularity. Shortly before his death he wrote (in French) a small volume of *Souvenirs*.—His bro., **MAX S.**, b. Brunn, Moravia, 1835, Sep. 27, impressario, was associated with Maurice. Among the famous artists introduced by the brothers S. to the Amer. public were Gottschalk, Parepa-Rosa, Marie Roze, Carlotta and Adelina Patti (their sister Amalia, was wife of Maurice S.), Carl Formes, Brignoli, Campanini, Lucca, Tietjens, Nilsson, and Marietta Alboni.

STRALSUND, *strāl'sunt*: fortified town and seaport of Prussia, province of Pommern, on the narrow strait Strela Sunde between the mainland and the island of Rügen. S. forms an island surrounded partly by the sea, partly by large pools of salt water, and connected with the mainland by three bridges. The natural strength of the place is greatly increased by formidable fortifications. Right in front of the harbor lies the fortified island of Dänholm. S. has narrow but regular streets; and many of the houses

STRAMASH—STRANGE.

are finely gabled, giving the town a quaint and ancient look. There are three great Gothic churches dating from the 14th and 15th c.; and the town-house, whose oldest part dates from 1316.—The public library, founded 1769, contains 60,000 vols. S. has large export-trade, especially in malt and corn, and has manufactures of leather, sugar, starch, mirrors, and cards. There entered the port (1884) 542 ocean ships, and 1,964 river-craft; cleared, 513 ships, 1,964 river-craft.—S. was founded 1209 by Prince Jaromar of Rügen, became a member of the Hansa, and rapidly rose into importance. During the Thirty Years' War, it was unsuccessfully besieged (1628) by Wallenstein; and after being, with alternations of fortune, in possession of Sweden about 200 years, it finally passed to Prussia 1815; but still retains much of its ancient municipal independence. Pop. (1880) 29,481; (1885) 28,981; (1895) 30,097.

STRAMASH, *n.* *stră-măsh'* [F. *estramaçon*, a quarter-staff, a blow, a two-edged sword—from It. *stramazzo*, a stretching blow, a violent fall—from *mazza*, a club]: in *Scot.* and *prov. Eng.*, a disturbance; a broil: *V.* to strike; to beat; to destroy.

STRAMINEOUS, *a.* *stră-mîn'ě-ūs* [L. *straminēus*, made of straw—from *stramen*, straw]: in *bot.*, straw-colored; strawy.

STRAMO'NIUM: see THORN-APPLE.

STRAMONY, *n.* *strām'ō-nŭ*, or **STRAMONIUM**, *n.* *stră-mō'nŭ-ŭm* [origin unknown]: the thorn-apple, whose leaves and seeds are used medicinally; the *Datūra stramōnŭm*, ord. *Solanacęæ*.

STRAND, *n.* *strānd* [Icel. *strönd*; Dan., Ger., and Sw., *strand*, border, margin]: the shore or beach of a sea, an ocean, or of a large lake: *V.* to drive or force on a shore or on shallows; to run aground, as a ship; hence, to come to a stand. **STRAND'ING**, *imp.* **STRAND'ED**, *pp.*

STRAND, *n.* *strānd* [Dut. *streen*; Ger. *strähn*, a hank, as of thread]: one of the strings of which a rope is composed.

STRANGE, *a.* *strānj* [OF. *estrange*, strange—from L. *extrānēus*, foreign—from *extra*, on the outside: It. *stranio*]: foreign; not before known; new; wonderful; unusual; rarely met with; eccentric; singular; in *OE.* remote. **STRANGE'LY**, *ad.* *-lŭ*, in a strange manner; in a way to cause wonder with a degree of dislike; in *OE.*, with some relation to foreigners. **STRANGE'NESS**, *n.* *-nēs*, the condition of being strange; reserve; coldness; distance of behavior; the power of exciting surprise; in *OE.*, uncouthness; remoteness from common manners or notions; mutual dislike: *V.* in *OE.*, to estrange. **STRANGER**, *n.* *strān'jēr*, a foreigner; one who is unknown; a visitor; one not admitted to friendship or fellowship; one not a domestic. **STRANGE-LOOKING**, *a.* having an odd or unusual look.—**SYN.** of 'strange': eccentric; singular; odd; irregular; outlandish; astonishing; marvellous; uncommon; queer; particular.

STRANGE—STRANGFORD.

STRANGE, Sir JOHN: English legal writer and reporter: 1696-1754; b. London. He became solieitor-gen. 1736, recorder of London 1739, Master of the Rolls 1754. His chancery and exchequer *Reports* appeared after his death, edited by his son (2d. ed. 2 vols., 1782); als a vol. *Select Cases on Evidence*. S. has been highly praised by some jurists, and doubted by others.

STRANGE, JOHN, LL.D.: British diplomatist and antiquary: 1732-1799; son of Sir John S. Being appointed Brit. resident at Venice he availed himself of the opportunity for antiquarian study, and made extensive collections in that department—a museum, a gallery of pictures, and an admirable library. He contributed many papers to *Archæol. and Phil. Transactions*. After his death his collected treasures were sold, and the bibliographer is still interested in the catalogue of them, *Bibliotheca Strangiana, etc.: Digested by Samuel Paterson* (London, 800, 1801).

STRANGE, *strānj*, Sir ROBERT: eminent engraver: 1721, July 14—1792, July 5; b. in the Mainland of Orkney; of old Scotch family. After a little abortive study of law at Edinburgh, he was apprenticed to an engraver there named Cooper. In 1745 he deserted art for arms, joining the Jacobite army of Charles Edward, not so much from enthusiasm in his cause, as to find favor with Isabella Lumisden, granddaughter of a bp. of Edinburgh. After the final collapse of the adventure, he was in hiding in the house where Miss Lumisden resided, and when it was searched by the soldiery, was somewhat ingloriously concealed by that young woman, who soon afterward married him. He went abroad with his wife, and at Paris was under the tutelage of Le Bass and of Descamps. In 1751 he settled in London, and speedily attained the very highest rank in his profession, especially by his plates of the Magdalen and of Cleopatra, after Guido 1753. On again going abroad in 1760 to execute plates of the most famous pictures of the old masters, his eminence was recognized by the academies of Paris, Rome, Florence, Bologna, and Parma, all of which conferred on him the honor of membership; and the distinction of knighthood 1787 testified to his favor in his own country. S. died in London, leaving a large fortune. To this day, S. is ranked at the very head of British engravers, and his reproductions of the nobler specimens of the old masters are much prized by the connoisseur.—See the account, with intelligent criticism, in the amusing work, *Memoirs of Sir Robert Strange, Knight, Engraver, etc.* (2 vols. 1855), by James Dennistoun of Dennistoun.

STRANGFORD (PERCY-CLINTON-SYDNEY SMYTHE), Viscount: British diplomatist: 1780, Aug. 31—1855, May 29. His mother was eldest dau. of Frederick Phillipse (q. v.) of N. Y. He graduated at Trinity Coll., Dublin, 1800. He succeeded to his title 1801; and after serving as sec. of legation at Lisbon, was ambassador successively to Portugal, Sweden, Turkey, and Russia. In 1825 he was raised to the Brit. peerage as Baron Penshurst. He pub. 1803 a transl. of Camoens's *Rmais*.

STRANGFORD—STRANGLES.

STRANGFORD (PERCY-ELLEN-FREDERICK-WILLIAM SMYTHE), Viscount: philologist: 1825, Nov. 26—1869, Jan. 9; b. St. Petersburg, where his father was Brit. ambassador. He was educated at Harrow and at Oxford. His linguistic studies took an almost unexampled range, though his writings pub. during his life comprised only articles in periodicals. His *Selected Writings* (2 vols.), ed. by his widow, appeared 1869; *Letters and Papers*, 1878.

STRANGLE, v. *sträng'gl* [OF. *estrangler*, to strangle—from L. *strangŭlō*; Gr. *strang'galaō*, I throttle]: to suffocate; to choke; to stifle; to destroy life by so compressing the throat as to stop respiration; to suppress at first appearance. **STRAN'GLING**, imp. *-glīng*: N. death by compressing the throat. **STRANGLED**, pp. *sträng'gld*: **ADJ.** killed by strangulation. **STRAN'GLER**, n. *-glēr*, one who strangles. **STRAN'GULATED**, a. *-gŭ-lā-tēd*, in *surg.*, having the circulation stopped in any part by compression; in *bot.*, contracted and expanded irregularly. **STRAN'GULA'TION**, n. *-lā'shŭn* [F.—L.]: act of destroying life by stopping respiration; the state of being strangled (see below): that kind of suffocation common to women in hysterics.

STRANGLES, *sträng'glz*: catarrhal disease, similar to and often called distemper (see **DISTEMPER**, in *Horses*), which affects the horse, mule, and ass. Among the causes are exposure, improper feeding, and impure air. The affected animal should be isolated and receive the best of care. In severe cases an abscess will form between the bones of the lower jaw. This should be poulticed, and when brought to a head should be opened. S. is a debilitating disease, and considerable time is required for recovery. During convalescence a liberal quantity of nourishing food should be supplied, and the degree of exercise or labor must be proportioned to the strength of the animal.

STRANGULATION—STRANGURY.

STRANGULA'TION: 'an act of violence in which ~~con~~striction is applied directly to the neck, either around it, or in the forepart, so as to prevent the passage of air, and thereby suddenly suspending respiration and life'—a definition by Dr. Taylor, which, as he observes, obviously includes Hanging (q.v.). The medico-legal relations of hanging and of the other varieties of S. are here to be considered. To the primary cause of death from hanging (see HANGING) it is necessary to add that if a person who has been hung has been cut down sufficiently soon to allow of the respiratory process being restored, he is not thereby safe—death often taking place from secondary effects at various periods. The most prominent morbid appearance in these instances has been extreme congestion of the brain.

When the suspension of the body has not continued much more than five minutes, and the parts about the neck have not suffered violence, there is probability that resuscitation may be established; though many cases are recorded when, after only a few minutes' suspension, this has been found impossible. It is believed that death takes place very rapidly and without suffering; the violent convulsions so often observed being similar to those in epilepsy. A man named Hornshaw, who was on three occasions resuscitated from hanging—a feat which he performed in London for amusement of the public—stated that he lost his senses almost at once; and other persons who have been restored report that the only symptoms of which they were conscious were a ringing in the ears, a flash of light before the eyes, then darkness and oblivion. The treatment after the patient has been cut down is briefly as follows: exposure to a free current of air; cold affusion if the skin is warm; application of ammonia to the nostrils, of mustard poultices to the chest and legs, and of hot water to the feet; and subsequent abstraction of blood if there be much cerebral congestion: artificial respiration also should be tried if the above means fail to re-establish the respiratory process. From the post-mortem appearances, together with circumstantial evidence, the medical practitioner has to decide such questions as these: Was death caused by hanging, or was the body suspended after death? Was the hanging the result of accident, homicide, or suicide? For discussion of these questions, see works on medical jurisprudence. In case of strangulation from other causes than that of hanging, the post-mortem symptoms are similar, but the injury to the parts about the neck is usually greater. In manual strangulation the external marks of injury will be in front of the neck, about and below the larynx; and if death has been caused by a ligature, the mark round the neck will be circular, whereas in hanging it is usually oblique. The internal appearances are much the same as in hanging.

STRANGURY, n. *străng'gũ-rĩ* [Gr. *stranggou'ria*, difficulty in passing urine—from *strangx*, a drop; *ouron*, urine]: in *surg.*, difficult and painful urination. **STRANGURIOS**, a. *străng-gũ'rĩ-ũs*, affected with or resembling strangury. —*Strangury* is perhaps to be regarded as a symptom

STRANRAER—STRAPPADO.

rather than a disease. It shows itself in a frequent and irresistible desire to pass water, which is discharged, however, in very small quantity, and with scalding and cutting pains along the urethra. The pain often extends to the bladder and even to the kidneys; and is sometimes so severe as to implicate the lower bowel (the rectum), and to produce the straining condition known as *Tenesmus*. It is caused usually by irritating substances in the urine, especially by *cantharides* or Spanish flies (whose irritant principle is liable to find its way into the renal secretion, whether the drug is taken internally or merely applied to the skin as a blistering agent), and by oil of turpentine administered internally in small doses; and is generally present in cases of gravel. Severe as the affection is, it is very transitory, and yields readily to treatment. After removal of the cause if it can be recognized and if its removal is possible, a dram of laudanum in a wine-glassful of starch mucilage should be thrown into the lower bowel, and mild mucilaginous draughts (e.g., of barley-water) should be freely given to render the urine less irritating. The warm bath also is useful, and, if it cannot readily be obtained, hot local fomentations often relieve the pain and cause the urine to pass more freely.

STRANRAER, *strân-râr'*: royal burgh, seaport, and market-town of Wigtownshire, Scotland; at the head of Loch Ryan; 6 m. n.e. of Portpatrick. The town depends on the agricultural interest. The oyster fishery in Loch Ryan, formerly very productive, has greatly declined. The harbor is tidal and shallow, but the loch gives good anchorage. Agricultural produce and cattle, leather, and shoes are exported. Pop. of royal burgh (1891) 6,171.

STRAP, n. *străp* [Dut. *strop*, a noose: Sw. *stropp*, a tie, a trap: L. *strappus*, a thong: Gr. *strophos*, a twisted band—from *strephō*, I twist]: long narrow piece of leather; a thong: iron plate for connecting two or more timbers, in which it is bolted or screwed: V. to fasten or bind with a strap; to punish with a strap. STRAPPING, imp. STRAPPED, pp. *străpt*. STRAP-SHAPED, a. in bot., in length about six times its own breadth. STRAPPER, n. *-për*, one who uses a strap: see also under STRAPPING. STRAPWORK, n. in arch., style of architectural ornamentation,



Strap work (from the door of St. Maclou, Rouen, 1420).

representing a band or bands crossed, folded, and sometimes interlaced with another. It was most common in the 15th and 16th c., but there are specimens which must be referred to the 11th century.

STRAPPADO, n. *străp-pă'dō* [It. *strappare*, a kind of torture: Swiss, *strappen*, to pull tight: Ger. *straff*, tight]: formerly, a military punishment in which the offender was drawn up to the top of a beam and then let fall, disloca-

STRAPPING—STRASBURG.

tion of a limb usually following: V. to punish or torture by the strappado. STRAL'PA'DOING, imp. STRAPPA'DOED, pp. -dōd.

STRAPPING, a. *strāp'pīng* [Bret. *strapa*, to make a noise: It. *strappare*, to tear away with violence]: bouncing; bulky; tall and stout; lusty; handsome. STRAP'PER, n. -pēr, *familiarly*, a well-grown and still-growing stout healthy young person of either sex.

STRASBURG, *strās'bērg* (Ger. *Strassburg*, *strās'būrch*; Fr. *Strasbourg*): fortified town, former cap. of the French dept. of the Bas-Rhin, but, since 1871, cap. of the new German province of Alsace-Lorraine (Elsass-Lothringen); at the confluence of the Ill and the Brusche; about 2 m. from the left bank of the Rhine, 89 m. n. of Basel, 312 m. e. of Paris by rail. The citadel, built by Vauban 1684, was demolished by the Germans during the bombardment of 1870; but 1873 they began to rebuild it, and this, with a system of 14 detached forts three to five m. from the central town, makes the position a fortress of the first rank. The most celebrated building is the minster, or cathedral, founded 1015, whose nave is one of the most sublime specimens of Gothic architecture. Of the two w. towers, one, that at the s. corner, has not been completed. The other, finished 1399, rises, according to Baedeker, 495 ft. above the pavement—14 ft. higher than the original top of the Pyramid of Cheops, and 17 ft. less in height than the towers of Cologne Cathedral. The minster has a remarkable astronomical clock (1838-42) representing the planetary system. Other notable structures are the Prot. Church of St. Thomas, with the tomb of Marshal Saxe and various monuments to distinguished S. scholars; the *Temple Neuf*, or New Temple, the synagogue of the Jews, the town-house, the Palace of Justice, the arsenal, the episcopal palace, and the theatre. The Univ. of S. was the only complete univ. in France—i. e., the only one with full complement of faculties—besides the Univ. of Paris. It was founded 1621, became specially famous in medicine and philology, went to the ground during the great Revolution, and had its place supplied by an *École Centrale*. In 1803 a Prot. acad. was established, with 10 chairs, for teaching theology, philology, philosophy, and history. Five years later Napoleon founded an imperial acad., with faculties of law, medicine, physical science, and philosophy; and 1819 a partial fusion of these academies took place, to the benefit of both. The univ. was reopened 1872, after the Franco-German war, as the Kaiser Wilhelm Univ.: in 1882 it had 104 professors and 825 students (216 from Alsace-Lorraine): a handsome building was erected for it 1884. The famous library of S., of nearly 200,000 vols., rich in *Incunabula* (q. v.), was entirely destroyed by fire during the bombardment of 1870; but has been replaced by a new collection contributed from all parts of Germany, that has now increased to about 600,000 vols.; though the precious incunabula and MSS. cannot be replaced.

The trade of S., especially its transit-trade, is very extensive, and it has great variety of manufactures—guns, rifles,

STRASS—STRATAGEM.

beer, patés de foie gras (see GOOSE), watches, clocks, leather, cottons, woollens, silks, cutlery, musical and mathematical instruments, jewelry, brandy, potash, tobacco, etc. The annual value of the S. pies (above noted) sent out is more than \$500,000. The Basel and Baden railways, the railway to Paris, and the communication with Rotterdam and London by the Rhine steamers, as well as with the Danube and all the great rivers of France by canals, gives large facilities for commerce. The country about S. is fertile and carefully cultivated, with beautiful gardens, mansions, and villages.

S., the *Argentoratum* of the Romans, was extant before the time of Cæsar, but is mentioned first by Ptolemy. The Romans had a manufactory of arms here. In the 5th c. it appears to have received the name *Strata-Burgum* or *Strata-Burgus*, perhaps from the invading Franks, whence the modern name. The city, after long struggle threw off by force the ecclesiastical rule of the bishops 1262; and S. became a free town of the German empire. The Reformation found early advocacy here. After more than seven centuries as a German city, it passed 1681 with the rest of Alsace into the hands of the French, under whom its pop. and prosperity greatly increased. 1870, Sep. 28, after a bombardment of seven weeks, S., with its garrison of 17,000 men, surrendered to the Germans, and 1871 was annexed to Germany.—Pop. (1871) 85,529; (1880) 104,471, about one-half Rom. Catholics; (1890) 123,560; (1900) 151,041.

STRASS, n. *strās* [from the name of its German inventor]: colorless glass, called also Paste, used as the base of artificial gems: see GEMS, IMITATION OF.

STRASS, n. *strās* [etym. doubt.]: the refuse of silk in the process of working into skeins.

STRATA, the plu. of STRATUM, which see.

STRATAGEM, n. *strāt'ă-jēm* [F. *stratagème*, stratagem—from L. and Gr. *stratēgēmā*, a piece of generalship—from Gr. *stratos*, an army; *agō*, I lead]: plan or scheme for deceiving an enemy, especially in war; a trick for gaining some advantage; deceit; imposition. STRATEGET'ICS, n. plu. *-ě-jēt'iks*, science of military movements; generalship. STRATEGIC, *strā-těj'ik*, or STRATEG'ICAL, a. *-i-kāl*, pert. to or done by stratagem, or according to the milit. science of strategy. STRATEG'ICALLY, ad. *-lī*. STRATEGIST, n. *strāt'ě-jīst*, one skilled in strategy. STRATEGY, n. *-jī*, science of maneuvering an army out of fire of an enemy, as *tactics* is the art of managing it in battle, or under fire. Strategy is the greater science, as including all those vast combinations which lead to subsequent available displays of tactics. A good strategist has to attend to the establishing of his basis and depots, though some brilliant generals have dared to act without these aids—notably, Sherman in his march to the sea 1864, and Wellington advancing from Portugal through Spain into France 1813. The strategist must know how to diffuse the influence of his arms over a broad area, while holding his force well in hand to strike crushing blows. Strategy, though applied in general to the conduct

STRATFORD—STRATFORD-DE-REDCLIFFE.

of complicated military movements, and having some relationship to stratagem, must not be confounded with the latter term. Stratagem is merely any device for deceiving the enemy as to the point or strength of an attack; e.g., ambuscades, *f i t s*, bugle-calls to imaginary troops, concealment of infantry by clouds of cavalry, etc. See WAR. STRATEGIC POINT, every point on the theatre of war which conduces to strengthen the line of operation or of communication.

STRATFORD, *străt'fêrd*: town, port of entry, and cap. of Perth co., Ont., Canada; on Avon river and the Grand Trunk railway; 88 m. w. of Toronto. It is in a grain, lumber, cheese, live-stock, and agricultural region; has excellent water-power; and manufactures flour, iron castings, machinery, steam-engines, agricultural implements, woolen goods, leather, and boots and shoes. The town shows much activity and enterprise. S. contains the co. buildings, town-hall, very handsome railroad station, 10 churches, 4 banks, and 1 daily and 5 weekly newspapers. Pop. (1871) 4,313; (1891) 9,501; (1901) 9,959.

STRATFORD: thriving town of Essex, England; on the Lea; 3 m. e. of London. It is the seat of various and extensive manufactures—flour-mills, distilleries, chemical works, etc. In the town and its suburb, many London merchants have their residences. Pop. (1851) 10,586, (1871) 23,286; (1881) 38,489; (1891) 42,982.

On the opposite side of the Lea is the parish of Stratford-le-Bow, or Bow: pop. (1881) 36,455; (1891) 40,378.

STRATFORD, usually STRATFORD-ON-AVON, *-ă'von*: municipal borough and township of England, county of Warwick; 8 m. s.w. of the town of Warwick, 26 m. s. of Birmingham; on the right bank of the Avon, which is here crossed by a stone bridge of 14 arches. S. is neatly built, and has quite a modern look, most of the old houses having disappeared; so that the borough has very little resemblance to what it was as Shakespeare saw it. The house in which he was born still stands, though externally much changed. The parish church is a cruciform building in Gothic style, with central tower and lofty spire: it was much improved in the 14th c., and in the 15th c. its beautiful choir was built, and about the end of that century the n. and s. transepts were added. The great poet is buried in the chancel, where his mural effigy is an object of great interest. The site of the house which he built in New Place has been bought by public subscription, and on it a theatre with library and picture gallery was built 1877 in his honor.—The town has little trade. Pop. of borough (1891) 8,318.

STRATFORD-DE-REDCLIFFE, *-dêh-rêd'klîf* (STRATFORD CANNING), Viscount: English diplomatist: 1786, Nov. 4—1880, Aug. 14; b. London; son of a London merchant, and first cousin of the statesman George Canning. He was educated at Eton, and entered himself of King's College, Cambridge, 1806, but left 1807, on receiving an appointment as *précis* writer in the foreign office. Later he resumed his studies, and took his degree M.A.

STRATH.

He was appointed first sec. of embassy at Constantinople 1808; and was acting minister plenipotentiary 1810-12, entering on his career of bold, shrewd, and successful oriental diplomacy. In 1812 S. effected the treaty of Bucharest between Turkey and Russia, which established British influence in Turkey for two generations. He was envoy to Switzerland 1814. In 1820 he went as plenipotentiary to the United States, and remained at Washington three years. In 1824 he was sent on special missions to St. Petersburg and Vienna. In 1825 he was appointed by Canning, then foreign sec., as ambassador extraordinary to the Sublime Porte, where his good offices were warmly exerted on behalf of the Greeks, though these were not successful till after a short war between Turkey and Russia 1829. In 1831 he was accredited with a special mission to Turkey, to fix the boundaries of the new kingdom of Greece, and to settle the treaty in virtue of which Otho ascended the Greek throne. He previously sat in the house of commons for various boroughs 1828-41. In 1841, having twice refused the gov.-generalship of Canada, he was appointed by the govt. of Sir Robert Peel ambassador at Constantinople, where his influence was strenuously exerted for civilization and for moral and material progress. In 1852 he received his title viscount. When the long-standing quarrel between the Greek and Latin monks in Palestine involved the powers of Europe in the struggle, S. remembered how Emperor Nicholas of Russia, had, 1829-53, sought to establish an influence, excluding all others, over the Porte, with the view of settling the destinies of Turkey, to the profit of Russia, when the propitious juncture should arrive. When Prince Menchikoff was sent to Constantinople on a mission from the czar, S. was prepared to resist the Russian demands. The keen diplomatic struggle, from 1853, between S. and the Russian ambassador extraordinary is narrated with dramatic power by Kinglake in his *Invasion of the Crimea*—a narrative which may perhaps be criticised as too dramatic for history. This however is certain—that S. inspired in the sultan toward England a profound confidence mingled with a wholesome fear; and by his influence with the Porte, succeeded in placing the Russian emperor in the wrong in his hostile act, 1853, July 3, which led to the Crimean war, in which France and England came to the aid of the Porte. S. retired from the Turkish embassy and largely from public affairs 1858.—In 1873 he published *Why am I a Christian?* and in 1876 a play, *Alfred the Great in Athelney*.

STRATH, n. *stràth* [Gael. *srath*, a plain beside a river, a broad valley; W. *ystrad*, a flat, a vale]: in *Scot.*, valley of considerable extent through which a river runs. The word is often prefixed in n. Scotland to the names of rivers, as Strathearn, Strathnairn, Strathspey, denoting the open valley through which a river flows. In such cases, however, as Strathmore (great valley), it signifies simply a valley-like depression. In s. Scotland, the Northumbrian word *dale* is used instead, e g. Clydesdale, Annandale.

STRATHAVEN—STRATIFY.

STRATHAVEN, *străth-ă'vn*, colloq. *stră'vn*: town of Scotland, in Lanarkshire, about a mile w. of Avon Water, 14 m. s.e. of Glasgow. On the n. side is the picturesque ruin of Avondale Castle, and 5 to 7 m. s.w. are the battle-fields of Drumclog and Loudoun Hill. The people are engaged chiefly in weaving and the cattle-trade. Pop. (1881) 3,812; (1891) 3,478.

STRATHCLYDE, *străth-klīd'*: name for Scottish Cumbria. In the 8th c. the ancient confederacy of the Britons was broken up into the separate divisions of Wales and English and Scottish Cumbria. Scottish Cumbria, or S., thenceforth formed a little kingdom, comprising the country between the Clyde and Solway, governed by princes of its own, with the fortress-town Alclyde or Dumbarton for its capital. Becoming gradually dependent on Scotland, it was annexed to the Scottish crown at the death of Malcolm I., on failure of the line of native sovereigns. Edgar bequeathed S. to his youngest brother David, again separating it from the crown of Scotland, which went to his intermediate brother, Alexander I. David held it throughout Alexander's reign in spite of that king's opposition; and on Alexander's death without issue 1124, S. was permanently reunited to the Scottish kingdom under David I.

STRATHMORE, *străth-mōr'* (Great Valley): most extensive plain in Scotland, a low-lying tract extending from Dumbartonshire n.e. to Stonehaven in Kincardineshire; bounded n. by the mountain-rampart of the Highlands, and s. by the Lennox, the Ochil, and the Sidlaw Hills; 100 m. long and 5 to 10 m. broad. S. proper, however, extends only from Perth to near Brechin in Forfar (about 40 m.).

STRATHPEFFER, *străth-pěf'fēr*: valley and watering-place in Ross-shire, Scotland, about 4 m. w. of Dingwall by rail.

STRATHSPEY, n. *străth'spā* [from the district in Scot. where first practiced]: Scottish national dance slower than the reel, which is said to derive its name from having been practiced first in the district of Strathspey. The name is given also to the lively tune used in the dance.

STRATIFY, v. *străt'î-fî* [F. *stratifier*, to stratify—from mid. L. *stratificāre*—from L. *strātum*, the thing spread, a covering; *faciō*, I make (see STRATUM)]: to lay or place in beds or layers; to arrange in beds. **STRATIFYING**, imp. **STRATIFIED**, pp. *-fid*: **ADJ.** in *geol.*, composed of layers or beds of rock-matter; arranged in beds or layers (see STRATUM). **STRATIFICATION**, n. *-kū'shūn* [F.—L.]: the act or process of arranging in beds or layers. **STRATIFORM**, a. *-fāwrm* [L. *strātum*, the thing spread; *forma*, a shape]: in layers or beds; applied to rock-masses, whether aqueous or igneous, having more or less a stratified appearance. **STRATIGRAPHY**, n. *stră-tīg'ră-fî* [Gr *graphō*, I write]: the arrangement or classification of any remains according to the stratum of the earth's crust to which they belong. **STRATIGRAPHICAL**, a. *străt'î-grăf'î-kāl*, of or pertaining to. **STRATIGRAPHICALLY**, ad. *-lî*.

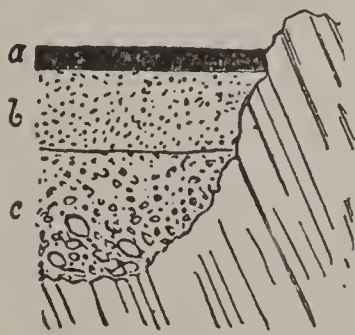
STRATIOTES—STRATUM.

STRATIOTES, *străt-î-ô'tēz* [Gr., a soldier]: genus of plants of nat. order *Hydrocharideæ*. *S. aloides*, popularly **WATER SOLDIER**, in lakes and ditches in e. England and other parts of Europe, also Siberia, is a singular plant with numerous leaves, which are strap-shaped and spring from the root, from which springs also the two-edged flower-stem, bearing the spathe with beautiful and delicate white flowers. In autumn the whole plant disappears, the root alone remaining at the bottom of the water; from which a number of young plants arise in spring, filling up ditches so that nothing else can grow in them. It is a very ornamental aquatic plant. It is known by a variety of common names, such as crab's-claw, knightswort, water-sengreen, etc.—The name *S.* is applied also in zoology to a genus of ground-beetles in S. America.

STRATOCRACY, n. *stră-tŏk'ră-sĭ* [Gr. *stratos*, an army; *kratos*, strength]: a military government. **STRATON'IC**, a. *-tŏn'ĭk*, of or relating to an army. **STRATOT'IC**, a. *-tŏt'ĭk*, warlike; military. **STRATOG'RAPHY**, n. *-tŏg'ră-fĭ* [Gr. *graphō*, I write]: a description of what belongs to an army. **STRAT'OGRAPH'ICAL**, a. *-ŏ-grăf'ĭ-kăł*, of or pertaining to.

STRATTON, *străt'ton*, CHARLES SHERWOOD: dwarf: 1838, Jan. 4—1883, July 15; b. Bridgeport, Conn. His first public exhibition as 'Tom Thumb' was in 1842 at P. T. Barnum's museum, New York. From this time until his death, except in short intervals, he gave exhibitions in this country and Europe, appearing at several European courts and in the principal cities. He acquired a large fortune.—His wife, **MERCY LAVINIA (BUMP) S.**, was born Middleborough, Mass., 1841, Oct. 31. She made her first appearance 1862, under Barnum's management, assuming the name of Warren. She was married to S. 1863, Feb. 10. In 1885 she married Count Primo Magri, an Italian dwarf, and has since given exhibitions with him.

STRATUM: one of the layers into which most of the rocks that form the crust of the earth are divided. It im-



Sedimentary Strata:
a, mud; b, sand; c, pebbles.
They all rest unconformably on older beds dipping at a high angle.

plies that the layers have been spread out over the surface; and that they were thus formed we may infer from the deposits now taking place in lakes and seas into which rivers laden with muddy sediment empty themselves. Technically in geol. a S. is a mass, whether thick or thin, separable in character from the rock above and below, and usually with mechanical separation; and if itself divisible, the divisions are termed 'layers,' or, if thick, 'beds.' Bed is used also synonymously with stratum.

All the aqueous rocks, which cover so large a proportion of the earth's surface, are stratified. They were

STRATUM—STRAUBING.

formed from the abraded materials of older rocks (aqueous or igneous), which have been washed down and rearranged. The kind of rock produced depended on the material to which the carrying agent had access. Fine mud would produce shales, sand sandstones, and calcareous matter limestones. In a section, these different kinds of rocks are frequently found to interchange within a short space: this is produced either by the water obtaining different materials, or changing its velocity. Thus the fine sediment which has fallen from slowly flowing water may be covered by a layer of sand brought down by a flood, and this again may have spread over it a covering of shells and corals, and such changes may go on alternately for an indefinite period. Each of the different beds composed of the same kind of material is called a S. Thus, in the series mentioned, there would be a S. of clay, one of sand, and then one of calcareous matter. An assemblage of strata having a common age is called a 'formation,' and this term is extended also to rocks which agree in their composition or origin. Thus we speak of stratified and unstratified, aqueous and igneous, freshwater and marine, primary and secondary, metalliferous and non-metalliferous formations. As a formation is composed of many different beds, so a S. is frequently made up of several 'laminæ' or 'layers.' The laminæ have more or less firm cohesion, but the strata easily separate from each other. Sometimes the cohesion of the laminæ is so great that it is as easy to split the rock against as with the grain. In such compact rocks the lamination is obscure, or altogether imperceptible in fresh specimens, but whenever they are exposed to the weather, it becomes obvious. The laminæ have been produced by short interruptions in the deposition, similar to what might result from tidal or other intermittent action. The degree of cohesion may be the result of rapid succession in the acts of deposition, but it is due frequently to metamorphic action subsequent to deposition. The planes of stratification lack the complete coalescence characteristic of lamination; when the contiguous layers are closely united, it is the result of the adhesion of two bodies, not of their coalescence into one.

STRATUM, n. *strā'tūm*, STRATA, n. plu. *strā'tă* [L. *strātum*, the thing spread out, a bed, a layer—from *ster-nĕrĕ*, to lay flat]: in *geol.*, a bed; a layer; a layer of rock which has been deposited as sediment in water (see below). STRA'TUS, n. *-tūs*, a widely extended continuous sheet of cloud increasing from below upward; a continuous layer of clouds; the cloud of night.

STRAUBING, *strow'bĭng*: town of Lower Bavaria, on the right bank of the Danube, 25 m. s.e. of Ratisbon, in a very fertile valley. It has a river-trade in corn, cattle, and horses. In a little chapel is a monument to Agnes Bernauer (q.v.)—Pop. (1889) 12,625.

STRAUSS.

STRAUSS, *strowss*, DAVID FRIEDRICH: critic of Christianity: 1808, Jan. 27—1874, Feb. 7; b. Ludwigsburg, Württemberg. His education was begun in his native town, and completed in the theol. seminary of Blaubeuren and the Univ. of Tübingen. In 1830, his head filled with Hegel's philosophy and Schleiermacher's theology, he began the life of a country pastor; but in the following year he was in Maulbronn acting as prof. in the seminary, and went thence to Berlin for six months to continue his Hegelian studies and hear the lectures of Schleiermacher. Returning to Tübingen 1832, he became *repetent* in the univ., lecturing with much favor on logic, history of philosophy, and history of ethics; and in the next years held also philosophical lectures in the univ. as a disciple of Hegel. Known as yet in only a narrow circle, he became a man of mark by the publication, 1835, of his *Life of Jesus Critically Treated* (2 vols. Tüb.; 4th ed. 1840; Eng. transl. 1846). In this work, from the point of view of a Hegelian philosopher, and designed only for the learned, he attempted to prove the received gospel history to be a collection of myths gradually formed in the early Christian communities; and sought, by an analytical dissection of each separate narrative, to detect, where it existed, a nucleus of historical truth free from every trace of supernaturalism. He strives to show the Christ of the gospels to be, in nearly all his character and life, merely the unreal product of the Hebrew messianic tradition and expectation. The book made an epoch in theological literature, and produced violent excitement in Germany and in other lands, calling forth numerous replies from opponents, frightening many by its bold disregard of consequences back into the ranks of orthodoxy, while stirring others to similar investigations. The first consequence to the author was his dismissal from his academical position in Tübingen, and transference to the Lyceum of Ludwigsburg. He resigned the new post, however, very soon in 1836, and retired into private life at Stuttgart, for leisure to defend himself. In 1837 he published his *Streitschriften* against his opponents; and 1838 *Zwei friedliche Blätter*, a more conciliatory exposition of his views. Early in 1839 he was called by the board of education in Zürich to be prof. of dogmatics and church history in the univ.; but the proposition raised such a storm of opposition that it was dropped, and the government even had to resign in the same year. Thrown back on his literary labors, S., who had published during the year his *Charakteristiken und Kritiken*, sent forth shortly afterward his second great work, *Die Christliche Glaubenslehre*, a review of Christian dogma 'in its historical development and its struggle with modern science' (Tüb. 1840-1). This formed a natural sequel to the critical investigation of the origins of Christianity in his first work. When S., after long silence, appeared again on the literary field, it was no longer as a professed theologian. In 1847 he drew attention by a work, *Der Romantiker auf dem Throne der Cäsaren, oder Julian der Abtrünnige*, full of direct allu

sions to the political situation of the day. His political efforts, however, made little popular impression. In some of his biographies S. appears to best advantage. A life of the Swabian poet Schubart (1849), and another biographical work, *Christian Märklin, a Picture of Life and Character from the Present* (1851), giving an insight into his own mental development, were his next literary efforts. His third period of activity was opened 1858 by a remarkable life of the Reformer Ulrich von Hutten (Eng. transl. 1874), followed by the publication of Hutten's *Dialogues*, 1860. A collection of miscellaneous *Minor Writings* appeared 1862, and a new *Life of Jesus, composed for the German People*, 1864 (Eng. transl. 1865). The title of the work indicates its popular cast—its peculiar features being a long critical statement of the labors of others in the same field, and an attempt to construct a life out of all the positive results that have been gained. The mythical hypothesis is retained, but applied differently. This second *Life* failed to equal the impression made by the first. Still later publications, 1865, are *Der Christus des Glaubens u. der Jesus der Geschichte* (Berlin), criticism of the newly published lectures of Schleiermacher on the life of Jesus; and a brochure, *Die Halben u. die Ganzen*, against Schenke. and Hengstenberg. The polemic against Schenkel, prof. of theol. in Heidelberg, a leader of the liberal party in the church of Baden, and author of the *Charakterbild Jesu* (1864), arose out of an earlier notice of this book by S. In 1872 S. published his last work, *Der alte und der neue Glaube*, in which he shows himself to have reached a grade distinctly lower than in his previous works—endeavoring to prove that Christianity as a system of religious belief is practically dead, and that a new faith must be built up out of a scientific knowledge of nature. An edition of his collated works (*Gesammelte Schriften*) appeared, 12 vols. (Bonn 1876–78).

The merely literary powers of S. were of very high order: no more effective German prose than his has been written since Lessing. But as a polemic, he was forcible merely through a rough and unqualified determination to annihilate all views differing from his own. As a critic of religion, he lacked moral and spiritual feeling; as a critic of philosophy, he lacked profoundness and penetration; as a critic of history, he lacked the faculty of human sympathy by which life and events are interpreted; as a critic of the gospel narrative, he lacked the necessary preliminary of a thorough investigation of the gospels themselves; as a critic of Christ, he lacked breadth of view as to the relation, natural or possible, between man and the divine. Consequently, his followers are a decreasing number. The attack on Christianity has shifted to quite other lines than those that S. pushed with such impressive zeal. S.'s assault has done Christianity a service in showing that—whatever points of weakness the church may present in either its ecclesiasticism or its dogmatism—the very citadel of its strength is in the living and real person of the Christ of the gospel story.—See *Life* by E. Zeller (Eng. transl. 1874).

STRAUSS—STRAW.

STRAUSS, JOHANN: composer and orchestral conductor: 1804, Mar. 14—1849, Sep. 25; b. Vienna. When 15 years of age he began to play the violin in public, afterward joined Launer's famous orchestra, organized a band 1825, and soon became the most popular composer of dance-music in the world. For six years he played at the Sperl, was appointed to furnish music for the court balls, and at length increased the membership of his orchestra to more than 200. He visited various European countries 1833–39, and was received with great enthusiasm, returned to Vienna, where his popularity increased, achieved a remarkable triumph in London 1849, and soon after his return to Vienna died of scarlet fever.—His son **JOHANN S.** (b. 1825) also became a very popular conductor and composer, visited the principal European cities, and 1872 came to the United States, and led an orchestra which played his compositions at the peace jubilee in Boston.—Another son, **JOSEF S.** (1827–70), became a noted and prolific composer of dance-music.—The youngest son, **EDUARD S.** (b. 1835), is the popular leader of a famous orchestra in Vienna. He has composed hundreds of pieces of dance-music. With his orchestra he made a tour of the larger cities of Europe 1889, and visited New York 1890.

STRAW, n. *straw* [AS. *streow*; Dut. *stroo*; Icel. *strá*, what is *strewed* to lie on, litter (see **STREW**): the stalks or stems of grain after being thrashed, as a bundle or heap of *straw*—usually in the singular form with a plural sense: a single stalk; anything proverbially worthless—though straw is now considered valuable (see **STRAW**, in **Agriculture**): **ADJ.** made of straw, or consisting of it (see **STRAW-MANUFACTURES**): **V.** to cover with straw; to strew, which see. **STRAW'ING**, imp. **STRAWED**, pp. *strawd*. **STRAWY**, a. *straw'y*, made or consisting of straw; like straw. **STRAW-COLORED**, a. of the color of straw. **STRAW-BERRY**, a creeping plant and its fruit—probably so called from the resemblance of its runners to *straws*, or from the wandering habit of the plant—strawberry meaning *stray berry* (see below). **STRAWBERRY-TREE**, shrub named from its fruit resembling the strawberry; the *Arbutus unedo*, ord. *Ericacææ*. **MAN OF STRAW**, the old clothes of a man stuffed with straw; hence, an imaginary person; a stuffed image.

STRAW, in **Agriculture**: largely used on the farm for bedding animals in stables, binding corn, feeding to cattle, and various other purposes. In the timberless regions of the west it is sometimes used for fuel, being burned in stoves constructed for the purpose. On new land, S. is often wasted, but in older settled regions of the United States it has long been thought necessary to return it to the soil in order to prevent exhaustion of the mineral elements. The introduction of commercial fertilizers (see **FERTILIZERS**) has modified this view, and where there is a demand for straw it is often best to sell it, and invest the proceeds in fertilizers. The S. of different kinds of grain varies greatly in value: that of rye is much stronger and tougher

STRAWBERRY.

than that of other grains. At the present writing, long rye S. sells in the New York market for nearly double the price of wheat or oat S., and for about four-fifths the price of good hay. Oat S. has considerable value for feeding to animals; wheat and rye S. also, though inferior, are used to some extent. Before being fed, S. should be run through a cutter, and mixed with corn-meal or some other concentrated food. The quantity of S. produced per acre, and the proportion of S. to the grain which it bears, vary greatly with the soil, season, and conditions of growth and development. High culture tends to increase the proportion of grain. The following may be considered a fair yield per acre and an average proportion of S. and grain:

| | Bushels. | Lbs. Grain. | Lbs. Straw. |
|----------------|----------|----------------|----------------|
| Wheat..... | 20 | 1,200 | 3,000 |
| Rye..... | 25 | 1,400 | 3,500 |
| Oats..... | 30 | 960 | 2,000 |
| Barley..... | 30 | 1,440 | 2,000 |
| Buckwheat..... | 30 | 1,440 | 2,000 |
| Flax..... | 30 | 1,680 | 2,400 |

The principal elements of fertility removed from the soil are found in the S. in the following quantities:

| | Lbs. Straw. | Lbs. Nitrogen. | Lbs. Phosphoric Acid. | Lbs. Potash. |
|--------------|----------------|-------------------|-----------------------------|-----------------|
| Wheat..... | 3,000 | 14.40 | 6.60 | 18.90 |
| Rye..... | 3,500 | 14.00 | 7.30 | 27.30 |
| Oats..... | 2,000 | 11.20 | 3.80 | 17.80 |
| Barley..... | 2,000 | 6.26 | 5.40 | 25.80 |
| Buckwheat... | 2,000 | 26.00 | 12.20 | 48.40 |
| Flax..... | 2,400 | 18.00 | 8.59 | 23.17 |

STRAW'BERRY [see STRAW], (*Fragaria*): plant of ord. *Rosaceæ*, largely cultivated. It is remarkable for the fact that the edible portion is not the real fruit—which consists of very small seeds scattered on or slightly imbedded in its surface—but is merely the receptacle therefor. The plant is perennial and herbaceous; leaves are produced on long stalks, and the three leaflets are coarsely serrated; the flowers are usually white, and have five petals. Propagation is effected by runners, but new varieties are secured from seed or by hybridization.

There are numerous species, only one of which, *F. vesca*, known as the Alpine or Wood S., is a native of Great Britain. It is indigenous also to the n. part of N. America; and several species are native to the United States. Of the latter, the best known is *F. Virginiana*, found wild from Fla. almost to the n. limits of vegetation, and w. to the Rocky Mountains, and of which there are many varieties. From these two kinds a large part of our cultivated sorts have been derived. A Chilean species, *F. Chilensis*, is found on the w. coast of the United States, and bears large fruit of poor quality. *F. Indica*, a species from upper India, whose fruit is of no value, is found in some of the s. states, and is regarded as an ornamental plant. There are two general classes of S. plants: staminate and pistillate. The former have perfect flowers. In the latter the stamens are either deficient or wanting, and plants of this

STRAWBERRY.

class must be grown near those which produce abundance of pollen. When every fifth row is of a good staminate sort, thus insuring perfect fertilization, the pistillate varieties will usually prove much more productive than the unisexual kinds. The yield of berries varies greatly with soil, climate, cultivation, and variety, but frequently reaches 150 bushels per acre, and yields of considerably more than twice that quantity have been reported.

Land for the S. should be moderately dry, very rich, deeply plowed, and thoroughly pulverized. Plants started in the ordinary manner may be set in either spring or fall. They will not yield a full crop till the second summer after transplanting. Potted plants—runners rooted in pots and transplanted with the earth in which they grew—if set in Aug. sometimes yield a large crop the next season, but there is considerable risk of failure. If the hill system is followed, rows are to be at least three ft. apart, and the plants one ft. apart in the row. This requires a large number of plants and a great deal of work in cultivation, but gives fine quality of fruit and large yield. In the matted row system, the rows are about four ft. apart, and the plants two ft. apart in the row. A space one or two ft. wide between the rows is kept clear by the use of the cultivator, but the plants are permitted to spread between the hills. There are various modifications of these systems. Runners should be cut off till after the fruit has formed. Weeds must be kept down, but cultivation late in the season is not desirable. In cold regions, unless the ground is covered with snow, straw or leaves should be spread between the rows and hills to protect the roots from injury by alternate freezing and thawing of the surface of the ground. This material should be free from the seeds of grass or weeds, must not be put on till the ground freezes or snow falls, and in spring is to be drawn between the rows, where it will serve as a mulch. In some cases a S. bed is kept for three years; but many growers prefer to make new beds each year, and plow the field as soon as one full crop has been secured.

The length of the picking season varies, with the locality and the varieties produced, from two to four weeks. The berries are picked, in the cooler portions of the day, into quart boxes; and are shipped in crates holding 32 boxes each. When the old beds are retained, the land must be kept rich by use of manure or commercial fertilizers. Some growers burn over the field after the fruit has been removed, in order to destroy weed seeds, insects, and dead leaves, also to improve the mechanical condition of the soil; but many consider the practice of doubtful utility. The principal enemies of the S. are the larvæ of the June-bug, which feed on the roots, and often are very destructive in land which has recently been in grass; and two classes of borers, one of which attacks the crowns and the other the roots of the plants. The former may be largely avoided by setting plants only on land previously under cultivation. Plants attacked by borers should be pulled up and burned. Various explanations of the name S.

STRAW-MANUFACTURES.

have been made, but none satisfactory. The idea that it was derived from the custom of placing straw around the plants is certainly incorrect. It is more probable that it came from the Anglo-Saxon word *strae* (stray) and had reference to the wandering propensities of the plant. The S. has been cultivated in England more than 450 years. In this country special attention was called to the fruit about 1835 by the introduction of a greatly improved variety originated by C. M. Hovey, of Cambridge, Mass., and known as Hovey's Seedling. There are now (1891) a great number of varieties under cultivation, many of which are remarkable for productiveness and for size and fine quality of fruit. On account of the improved means of transportation, the S. season in the New York market, formerly limited to about three weeks, now extends over nearly four months. The earliest fruit comes from Fla., and the latest from N. Y. and some of the New England states. A small quantity also is grown under glass, and is sold out of season, in the large cities, at enormous prices.

STRAW-MANUFACTURES: industrial applications of straw. These are of great commercial importance, especially that of plaiting, one of the oldest arts practiced by mankind, many specimens having been found in the tombs of the ancient Egyptians, and mention being made of plaiting by Herodotus and other early writers. The earliest notice of its systematic use in Europe as an article of clothing is in the records of the reign of Mary, Queen of Scots, who, we are told, observed that the peasants of Lorraine wore hats made of straw plait, and introduced it into Scotland 1562, but without much success. Her son, James I., carried it into England, where it soon thrived, becoming a permanent industry. It was regularly established first in Bedfordshire, which has ever since been its chief seat.

At first, the plait was what is called *whole straw*—that is, the straw was cut into suitable lengths without knots, and merely pressed flat during the operation of plaiting; and so it continued until the reign of George I. Later, split straw chiefly has been used. The splitting-instrument

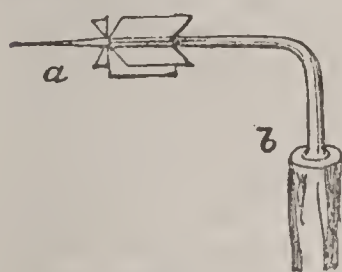


Fig. 1.

now employed (fig. 1) is of steel, and consists of a number of little square blades set circularly around the stem, which at one end terminates in the point *a*, and at the other is bent and fixed into the handle *b*. The point *a*, being inserted into the hollow of the straw, is pressed forward, and cuts it into as many strips as there are blades in the cutting-tool; these vary in number according to the fineness of the work to be produced.

It is found that the fine straw-plaiting can be made from only one or two varieties of wheat, that called the White Chittim being generally preferred, and next to it the Red Lammas. The harvesting is a matter of great anxiety, as

STRAW-MANUFACTURES.

the straw is liable to many injuries from wet and other causes. The value of this crop appears in the fact that an acre will yield 25 to 40 bushels of wheat and from 15 cwt. to a ton of straw.

The ears are cut off by hand for thrashing. The straws are afterward cut into lengths, and cleared of the outer sheath or leaf; they are then sorted into various thicknesses by an apparatus consisting of a series of sieves about eight inches in diameter, arranged as in fig. 2, *a, a, a, a*; the boys who usually do this work hold a handful on end

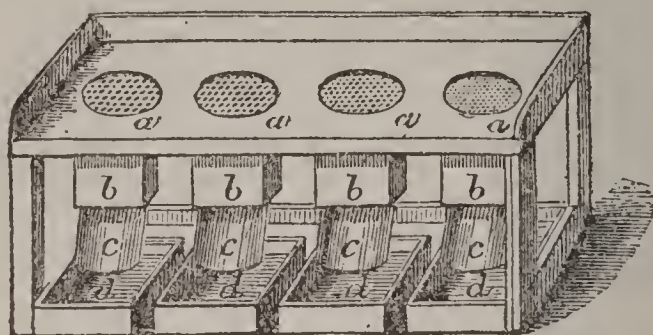


Fig. 2.

over the first sieve, which has the narrowest spaces, and the thinnest straws only fall through it; the straws are next placed on the second, and so on to the last. As they fall through each successive sieve, they pass down the hollow shafts *b, b, b, b*, by the shoots of tin or sheet-zinc *c, c, c, c*, into the boxes *d, d, d, d*, from which they are removed and tied into bundles ready for the splitters, who reduce them to strips of the sizes required.

The plaits are made largely by women and children in their homes. They are very various in pattern and in price.

In the United States the straw-manufacturing industry was begun in New England, and for many years was confined to the coarse grades of hats. About 1800, manufacturers in England began making hats of finer grade, and soon afterward in Conn. a similar improvement was attempted. In 1822 the Brit. Soc. of Arts awarded a silver medal and 20 guineas to Sophia Woodhouse, of Conn., for having made unusually fine plaits, from a new material, thought to be equal to the best Italian straw. At that time several establishments in New England were engaged in straw-hatting; but the choicest hats were either imported from Leghorn or Tuscany, Italy, or from the Dunstable factories, England; or were made here from imported Italian material, which came in flats and braids. The development of the industry was accelerated by improved machinery, till in the entire process of braiding, plaiting, forming, and sewing there was little need of hand labor. In 1860 the value of straw goods manufactured in the United States was \$4,395,616; (1870) \$7,282,086; (1880) \$9,345,759. In 1890 there were 77 manufacturing establishments, using \$3,333,560 capital, employing 10,948 hands, paying \$2,556,197 in wages, and

STRAY—STREAM.

working up material valued at \$5,455,559. The seat of the industry was in Mass., which had 33 establishments, and products valued at \$6,898,628. Ill. was second, with 8 establishments and \$484,609 products; Conn. third, 3 establishments, \$419,270 products; Md. fourth, 3 establishments, \$362,982 products; N. Y. fifth, 4 establishments, \$264,692 products; N. J. sixth, 3 establishments, \$251,900 products; and Wis. seventh, 1 establishment, \$250,000 products. Nearly all the material is imported, and reaches the manufacturer in an advanced stage of preparation. The finest comes from Leghorn, Tuscany, Bohemia, and Switzerland; the medium grade from China (Canton), Japan, and several countries in s. Europe; and the cheap grade, as the Mackinaw, from Canada. Chip and Panama hats, though often sold for straws, are made from other materials; the chip from the splints of the Lombardy poplar after the sap has been dried out thoroughly, the Panama from the immature leaves of a palm-tree indigenous to S. America and Cuba.

Besides its value for plaiting, straw is now much used in the manufacture of Paper (q.v.); and as a cheap component part of other articles.

STRAY, v. *strā* [OF. *estraier*, to stray—from mid. L. *extrārius*, a stranger, a beast that has lost his master—from L. *extra*, on the outside]: to wander, as from a known place, from a company, or from proper limits; to ramble; to err; to go at large; in *OE.*, to mislead: **ADJ.** having gone astray; wandering: **N.** an animal that has wandered. **STRAYING**, imp.: **N.** act of going astray. **STRAYED**, pp. *strād*. **STRAYER**, n. *strā'ēr*, one who strays.—**SYN.** of 'stray, v.': to wander; deviate; swerve; rove; ramble; roam.

STREAK, n. *strēk* [Low Ger. *streke*; Dan. *streg*, a streak: Ger. *streich*, a stroke: Dut. *streek*, a line marking the course of a blow: Gael. *strioch*, a line]: a line or long mark of color different from the ground; in *min.*, that appearance which the surface of a mineral presents when scratched by a hard instr., or the appearance which a mineral leaves on a rough porcelain slab when forcibly drawn or stroked along its surface; in *bot.*, a straight line formed by a vein, by color, or by indentation; a range of planks running fore and aft on a vessel's side—also called a *strake*: **V.** to variegate with lines of a different color; to stripe. **STREAKING**, imp. **STREAKED**, pp. *strēkt*, marked with lines of a different color. **STREAKY**, a. *strēk'ŷ*, variegated with lines of a different color.

STREAM, n. *strēm* [Icel. *straumur*; Dut. *stroom*; Sw. and Dan. *ström*; Ger. *strom*, a stream]: a flowing water; a current of water or of any liquid; anything issuing or proceeding in a line or continuous body, as gas, air, light, a multitude of people, etc.; a river; anything moving onward in a continuous course: **V.** to move onward in a continuous course; to flow, as a liquid; to pour out in abundance; to pour; to send forth; to throw a stream. **STREAMING**, imp.: **ADJ.** flowing; emitting a stream of anything. **STREAMED**, pp. *strēmd*. **STREAMER**, n. *-er*, that which

STREATOR—STREET.

streams or floats; a flag or pennon floating in the wind. STREAM'ERS, n. plu. *-érs*, popular name for the aurora borealis; northern lights. STREAM'Y, a. *-î*, abounding with water. STREAM'LET, n. *-lét*, a little stream. STREAM-ANCHOR, a ship's anchor, lighter than the bower-anchor. STREAM-ICE, a continued ridge of pieces of ice running in a particular direction. STREAM-TIN, rolled fragments of tin-stone, found mingled with gravel, etc., in the gullies and water-courses of Cornwall. GULF STREAM: see under GULF. STREAM-WORKS, workings in the loose clays, gravels, sands, etc. which cover the valleys of a country, and from which the metal or ore is obtained by repeated washings.—SYN. of 'stream, n.': current; tide; course; rivulet; burn; flow; rush; gush.

STREATOR, *stré'ter*: city in La Salle co., Ill.; on the Vermilion river, and on the Atchison Topeka and Santa Fé, the Indiana Illinois and Iowa, the Chicago and Alton, the Chicago Burlington and Quincy, and the Wabash railroads; 16 m. s. of Ottawa, 96 m. w. of Chicago. It has 8 churches, 7 public schools, school property valued at \$57,250, 2 national banks (cap. \$150,000, and 4 daily, 4 weekly, and 1 monthly periodicals. The headquarters of the great Vermilion coal-fields are here. Pop. (1880) 5,157; (1890) 11,414; (1900) 14,079.

STREEL, v. *strél* [Gael. *srol*, a banner, a thing loose which floats or flutters]: in *Ireland*, to trail on the ground, as a long dress; to drag carelessly along the ground. STREEL'ING, imp. STREELED, pp. *strêld*.

STREET, n. *strêt* [Dut. *straat*; Ger. *strasse*; It. *strada*, a paved way—from L. *stratum*, a pavement—from *sternêrê*, to lay down]: *anciently*, any paved road; hence, a way or road in a town, usually lined or intended to be lined with houses on one or both sides; a public place (see ROADS AND ROAD-MAKING: PAVEMENT). STREET-CROSSING, a carefully paved part of a street for foot-passengers crossing from one side to the other. STREET-DOOR, front or entrance door of a house. STREET-WALKER, a common prostitute, as soliciting on the public streets.—SYN. of 'street': road; highway; lane; alley; by-way.

STREET, *strêt*, ALFRED BILLINGS: author: 1811, Dec. 18—1881, June 2; b. Poughkeepsie, N. Y. He studied law with his father, and practiced in Monticello, N. Y. In 1839 he removed to Albany, and 1843-4 edited the *Northern Light*; from 1848 until his death was state librarian. He wrote much for publication both in prose and poetry. A number of his poems have been translated into German. Among his works are: *The Burning of Schenectady, and Other Poems* (1842); *Frontenac*, poetical romance (1849); *Woods and Waters, or the Saranacs and the Racket* (1860). He died at Albany.

STREET—STREMMMA.

STREET, AUGUSTUS RUSSELL: 1791, Nov. 5—1866, June 12; b. New Haven, Conn. After graduating from Yale 1812, he studied law, but, his health being poor, he did not practice. He travelled in Europe 1843–48. The fortune which he inherited was largely given to Yale College for the establishment of its admirable school of fine arts, a professorship of modern languages, and a chair in the theol. department. His daughter became the wife of Admiral Foote. He died at New Haven.

STREET, GEORGE EDMUND, R.A., F.S.A.: architect: 1824–1881, Dec. 18; b. Woodford, Essex, England. He was educated at Camberwell, and studied architecture with the best teachers. In 1847 he won one of the £100 prizes for a design for a new foreign office; and 1850 was appointed architect for the diocese of Oxford, and later for those of York, Ripon, and Winchester. In 1855 he published *The Brick and Marble Architecture of Italy*; and 1865 *The Gothic Architecture of Spain*, beautifully illustrated with his own drawings. Among his numerous and important architectural works are the nave of the Bristol Cathedral; the Crimean Memorial Church, Constantinople; and the new Courts of Justice in London. He was buried in the nave of Westminster Abbey.

STREIGHT, a. *strât* [L. *strictus*, straight, tight (see STRAIT)]: in *OE.*, strict; limited; spare: N. a strait; difficulty: AD. strictly.

STRELITZ, strêl'its, properly *Streltzi* (arquebussiers): ancient Russian militia-guard, raised first by Ivan Vassilevitch the Terrible, in the second half of the 16th c. At that time and long afterward they were the only standing army in Russia, numbering sometimes 40,000 to 50,000 men. They were located at Moscow in time of peace, in a quarter of the capital set apart for them; and, being the bravest and most trustworthy troops in the army, received special favor and distinctions. But like all such petted corps, the Roman Pretorians, the Turkish Janizaries, and the Egyptian Mamalukes, their general turbulence, frequent revolts against the government (notably during the Demetrian insurrections), and incessant conspiracies, rendered them more formidable to the Russian government than to external enemies. The S. having, at the instigation of the Grand Duchess Sophia and the chiefs of the Old Muscovite party, revolted against Peter the Great, that iron-handed ruler caused them to be decimated (1698) in the great square of Moscow, and the remainder to be banished to Astrakhan. The feeble remnant still manifesting their characteristic turbulence and disloyalty, Peter exterminated them almost completely 1705. Few Russian families at present can claim kindred with the old Streltzi; but the family of Orloff (q.v.) is a prominent exception, being descended from a Strelitz who was pardoned by Peter the Great while the axe was being raised to behead him.

STREMMMA, n. *strêm'a* [Gr., a twist, a strain—from *strephō*, I turn, I twist]: in *pathol.*, a strain or sprain of the parts about a joint.

STRENGTH—STRENGTH OF MATERIALS.

STRENGTH, n. *strēngth* [from **STRONG**, which see]: the muscular power or energy which animals can exert at will; solidity; firmness; quality of sustaining or resisting the application of external force; power or vigor of any kind; power of mind; support; spirit; animation; soundness; legal force; confidence imparted; quality of affecting bodies; or of producing sensible effects on them; richness in any character or ingredient, as alcohol in wine; potency of liquors; amount of force; military or naval force; in *OE.*, fortification; fortress. **STRENGTH'LESS**, a. *-lēś*, without strength. **STRENGTH'EN**, v. *-n*, to add strength to; to grow stronger; to fix in resolution; to invigorate; to confirm. **STRENGTH'ENING**, imp.: N. process by which anything is strengthened. **STRENGTH'ENED**, pp. *-nd*. **STRENGTH'ENER**, n. *-n-ēr*, one who or that which strengthens; a medicine which adds strength to the body. **ON or UPON THE STRENGTH OF**, in reliance upon; in confidence imparted by. —**SYN.** of 'strength': support; security; validity; armament; force; power; robustness; toughness; hardness; stoutness; brawniness; lustiness; firmness; confidence; energy; authority;—of 'strengthen': to invigorate; establish; fortify; animate; encourage.

STRENGTH OF MATERIALS: subject of that department of engineering which deals with stresses in parts of structures. The strength of materials depends on their physical constitution—viz., their form, texture, hardness, elasticity, and ductility.

The resistance of materials in engineering works is tested in reference to various strains: such are—1. Extension or tension; 2. Compression or crushing; 3. Transverse or cross strain; 4. Shearing strain; 5. Torsion or twisting strain.

1. *Extension*.—When a rod is suspended vertically, and a weight attached to its end tending to tear it asunder, all its fibres act equally, and its strength evidently depends on the strength of the individual fibres and their number—that is, the area of cross-section of the rod. The following table gives the resistance to *rupture* of some of the most common materials:

| | Per. Sq. Inch. |
|--|----------------|
| Fine sandstone..... | 200 lbs. |
| Brick | 300 " |
| Common lime..... | 50 " |
| Portland cement..... | 240 " |
| Deal (timber)..... | 5 tons. |
| Cast-iron (ordinary)..... | 6½ " |
| “ Stirling's toughened..... | 12½ " |
| Wrought-iron, boiler-plate..... | 20 to 24 " |
| “ bars..... | 25 " |
| Cast steel .. | 60 " |
| Ropes (hemp), four-fifths ton per pound-weight per fathom. | |

Regarding elongation of materials under tensional strain, it has been observed that to a certain limit, differing for different substances, the elongation is proportional to the extending force, a physical fact whose promulgation is due to Hooke (q.v.); to this limit also the body recovers nearly its original form on removal of the force: this limit is called the limit of elasticity. When this limit is passed,

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the permanent elongation or destruction rapidly increases until rupture takes place.

The extension of wrought-iron is about $\frac{1}{10000}$ of its length per ton of strain per sq. inch, and that of cast-iron $\frac{1}{5000}$. The limit of elasticity of wrought-iron is attained under a strain of 12 tons per sq. inch; and in the case of American pine $1\frac{1}{2}$ ton per sq. inch.

2. *Compression or Crushing Strain.*—The strength of pieces of stone, wood, or iron, whose height is small in proportion to their area, and which absolutely crush under the strain, is proportional to the area of their horizontal section. The following table gives the resistance to crushing of some common materials:

| | |
|-------------------|-----------------------|
| Cast-iron..... | 50 tons per sq. inch. |
| Wrought-iron..... | 16 " " " |
| Brickwork..... | 30 tons per sq. ft. |
| Sandstone..... | 200 " " " |
| Limestone..... | 490 " " " |
| Deal..... | 450 " " " |
| Oak..... | 650 " " " |

As far as to a certain strain, called the limit of elasticity, the diminutions in length of the body are proportional to the compressing force; and are practically the same in amount as the elongations in the case of tensional forces. In wrought-iron the limit is 12 tons per sq. inch; after that strain, its shape and proportions become permanently altered; and where these are of consequence, as in most practical cases, we come to the limit of its utility, which is reached when the load is about 16 tons per sq. inch. It then oozes away beneath additional strain, as a lump of lead would do in a vise.

The mode of ultimate failure of cast-iron is quite distinct from that of wrought-iron. It crushes suddenly by the sliding off of the corners in wedge-shaped fragments, being a crystalline mass without sufficient ductility to allow its bulging horizontally; the angle of rupture at which these wedges slide off being approximately constant, varying from 48° to 58° . The limit of elasticity is attained in cubes of deal under a compression of 100 tons per sq. ft.; and in those of oak, 150 tons per sq. foot.

Pillars, round or square, may be divided into three classes—1. Those whose height is not more than 5 times their diameter; 2. Those whose height is between 5 and 25 times their diameter; 3. Those whose height is at least 25 times their diameter. The first follow the same laws as cubes or pieces of small height above discussed, and are absolutely crushed; their strength being proportional to their cross-section. The second are broken across, partly by crushing, partly by bending. The third give way purely from bending as with a transverse strain, and their strength is found by experiment to be directly proportional to the fourth power of their diameter, and inversely proportional to the square of their length. Thus, in the case of two long pillars of equal length, but of which one has its diameter double that of the other, the strength of the former will be 16 times that of the latter; from which will be apparent the advantage of the tubular form for

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pillars, as it gives large diameter combined with lightness.

In the case of long columns whose length is 25 or more times their diameter, if we represent the strength of a long cast-iron column of any dimensions by 1,000, the strength of a wrought-iron column of the same dimension will be 1,750; of cast steel, 2,500; of Danzig oak, 110; of red deal, 80.

3. *Transverse or Cross Strain*.—When a beam fixed at one end is loaded with a weight at the other, it is bent from its original form, and takes a curved shape. The fibres on

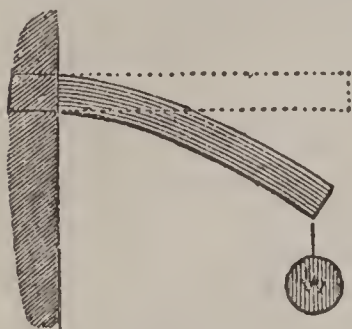


Fig. 1.

the upper or convex side of the beam are extended, and those on the under or concave compressed; while at the middle of the beam, there are fibres which are neither extended nor compressed, where the compression ends and the extension begins: this surface of fibres is called the neutral surface.

As long as the beam is not strained beyond the limit of its elasticity, the extensions and compressions for a given strain are nearly equal, and therefore the neutral surface passes through the centre of gravity of the cross section of the beam.

If we strain the beam beyond this limit, and approach the breaking strain, the extensions and compressions are no longer equal, and therefore the position of the neutral surface is not readily determined; e.g., in the cases of stone and cast-iron, the amount of compression is much less than that of the extension, and in the case of timber greater. Also the extensions and compressions are no longer proportional to the strains. For these causes the position of the neutral axis, and the amount of strain on the different parts of the cross section at the moment of rupture, cannot be determined by theory.

Different theories have been proposed to determine the relative strength of similar beams, while their absolute strength is left to experiment. That of Galileo consists in supposing the beam incompressible, and that it gives way by extension turning round the lower edge, each point of the section giving an equal resistance before rupture. That of Mariotte and Leibnitz supposes the beam in like manner to turn round its lower edge, but considers that the resistance given by each point of the section is proportional to its distance from that edge.

The theory now generally adopted consists in supposing the extensions and compressions to continue to the point of rupture proportional to the strains, as is actually the case as far as the limit of elasticity; and therefore, that the beam turns round a neutral axis, passing through the centre of gravity of the cross section, the force given out by each point being proportional to its distance from the neutral axis. This last theory is found to give the best results in the case of timber and wrought-iron, especially wrought-iron arranged in the forms usual in girders. The

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second represents nearly the method of failure of stone, and the first that of cast-iron.

Though none of these theories give accurate results, they yet give means of determining, from particular experiments, the strength of any other beam whatever. E.g., these theories agree in giving the strength of a rectangular beam to be proportional to the area of cross section multiplied by the depth, and inversely proportional to the length of the beam, since the strain increases directly as the length. This, when expressed mathematically, is

$$W = C \frac{bd^2}{l} \quad (\text{I.});$$

where w = breaking weight in tons.

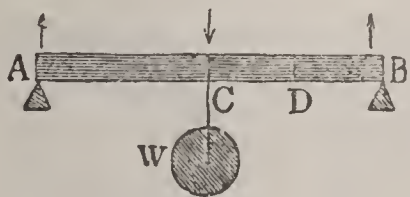
b = breadth of beam in inches.

d = depth of beam in inches.

l = length of beam in inches.

C = a constant number for beams of the same material, to be determined by experiment.

This result is borne out by experiment—i.e., the constant C being determined by experiment on one beam, the strength of any other is found by multiplying its breadth by the square of its depth and by the constant C , and then dividing by its length. In the case of a beam supported at each



end and loaded by a weight in the middle, as in fig. 2; the strength is given also by the formula,

$$W = c \frac{bd^2}{l} \quad (\text{II.});$$

but c , in this case, is 4 times the value of C in the formula for a beam loaded at one end. The truth of this appears from the consideration that the beam ACB , fig. 2, may be treated as if it were two beams, each fixed at the point C at one end, and pressed upward by the reaction of the supports at A and B , their other ends. This reaction is evidently equal to $\frac{W}{2}$; so that the breaking weight of the whole beam ACB , supported at both ends, resolves itself into that of the beam CB or AC of length $\frac{l}{2}$, acted on by the weight at one end $\frac{W}{2}$; this by formula (I.) is,

$$\frac{W}{2} = C \frac{bd^2}{\frac{l}{2}}$$

$$\text{or, } W = 4C \frac{bd^2}{l} = c \frac{bd^2}{l};$$

therefore, $c = 4C$ or $C = \frac{1}{4} c$.

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Experiments on the transverse strength of beams are made usually in the manner of fig. 2. The following table, from experiments, gives the value of c for beams supported at each end and loaded in the middle:

| | Tons. |
|-------------------|------------------|
| Cast-iron..... | 13 $\frac{1}{4}$ |
| Wrought-iron..... | 12 |
| English oak..... | 2 $\frac{1}{2}$ |
| Red pine..... | 2 $\frac{3}{8}$ |

These numbers when substituted in the formula give the breaking weight; $\frac{1}{3}$ of this will be the safe load in practice. The transverse strength of cast-iron is considered so good a test of its value, that in specifications of iron-work, it is generally required to be of such a quality that a bar of it, of certain dimensions, will bear a specified weight at the centre; e.g., 'that a bar of it, 42 inches long, 2 inches deep, and 1 inch wide, set on bearings 36 inches apart, shall bear, without breaking, 30 cwt. suspended in the middle.' If a beam be loaded uniformly over its length, as in fig. 3, it will bear twice as much as if the load be condensed at the centre, as in fig. 2. Also, if the load be placed some distance from the centre, as at D, fig. 2, the load it will bear is to the load borne at the centre, C, inversely as the rectangles of the segments into which the beam is divided by the point of application of the load are to one another, that is, as $AC \times CB$ or $\frac{l^2}{4}$ is to $AD \times DB$, from which it follows that it will bear less weight at the centre than at any other point.

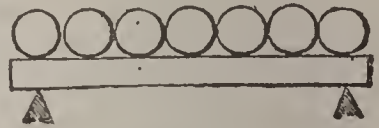


Fig. 3.

Since the strength of a rectangular beam is proportional to the square of the depth, multiplied by the breadth, it is evident that by increasing the depth and diminishing the breadth we shall, to a certain limit, increase the strength of a beam without increasing its weight; e.g., let A and B, fig. 4, be the sections of two beams, of which A is 2 inches broad and 2 deep, and B 4 inches deep and 1 inch broad, they are of the same sectional area, viz., 4 sq. inches, but the strength of B is to the strength of A as $4^2 \times 1$ is to $2^2 \times 2$, or as 16 to 8, that is, 2

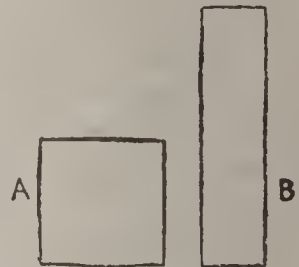


Fig. 4.

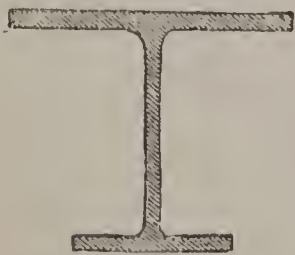


Fig. 5.

breaking weight:

to 1, i.e., B is twice the strength of A. Hence arises the advantage of the double T forms so generally used in iron girders, fig. 5, the strength of which forms are proportional to the area of the top or bottom plates multiplied by the depth. For a beam of the form in fig. 5, loaded as in fig. 2, the following formula will give the

$$W = C \frac{ad}{l}:$$

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where $a =$ { the area of the top or bottom flange in sq. inches.
 $C =$ { 4 times the destroying load per sq. inch of the material, under direct tension or compression in tons.
 $d =$ depth of the beam in ft.
 $l =$ length between supports in ft.
 $W =$ breaking weight at the centre in tons.

For cast-iron beams, when the area of the bottom flange is made 6 times that of the top, which has been found by experiment the best arrangement, and the strength is measured by the tensional strain, supported by the bottom flange, that is, $6\frac{1}{2}$ tons per sq. inch,

$$C = 6\frac{1}{2} \times 4 = 26 \text{ tons.}$$

For wrought-iron beams,

$$C = 4 \times 20 = 80 \text{ tons for the lower flange, and}$$

$$C = 4 \times 16 = 64 \text{ tons for the upper flange.}$$

Another way of throwing the great body of the material at a distance from the neutral axis is to make it into the

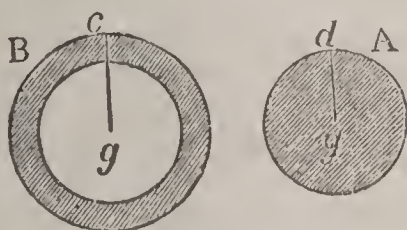


Fig. 6.

shape of a tube or hollow cylinder. Let B be the section of a hollow cylinder, the thickness of whose walls is represented by the shaded ring; and A be the section of a solid cylinder of the same material. If the area of A is equal to that of the ring in B, the two

cylinders will contain the same quantity of matter, but B will be stronger than A, nearly in proportion as cg is longer than dg .

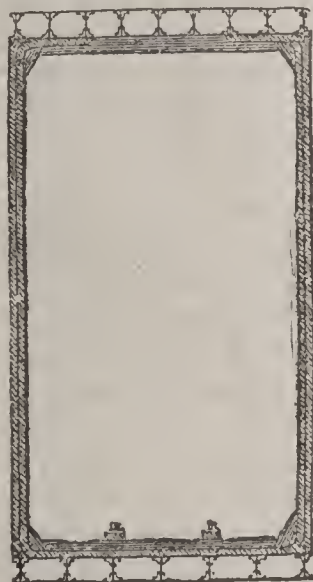


Fig. 7.

The principle of hollow structure prevails both in nature and art, wherever strength and lightness have to be combined. It is seen in the stems of plants, especially of the grasses; also the bones of animals are hollow, and those of birds, where great lightness is required, are most so. A feather, with its hollow stem, is perhaps the best instance of the union of strength and lightness. In art, again, we have hollow metal pillars; and sheet-iron for roofing and other purposes is *corrugated*, or bent into ridges and furrows, to give it depth. Each ridge or furrow is, as it were, half a tube, and resists bending with twice or thrice the

energy that it would exert if flat.

The most striking application of the principle of hollow structure is seen in tubular bridges. Fig. 7 represents a section of the tube of the Conway Bridge. The object being to resist a vertical strain, the form is made rectan-

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gular, and the chief mass of the material is thrown into the top and bottom. The tube may, in fact, be considered as an immense beam or girder constructed on the principle of fig. 5, the top and bottom being the two flanges, and the two sides serving to connect them, instead of the one rib in the middle. As it is constructed of plate-iron, the top requires more metal than the bottom, in order to resist the compression; but instead of putting the metal into one thick plate, or into several plates laid the one on the other, it is made to form a set of minor tubes or cells, which give additional stiffness and strength to the whole tube. The floor, in like manner, contains cells. Each of the tubes over the Conway is 24 ft. high, 14 ft. wide (outside), and 420 ft. long, and weighs 1,300 tons; yet these enormous hollow beams sustain not only their own weight, but the heaviest railway-trains without sensible deflection.

Fig. 8 represents an ingenious contrivance for strengthening the wooden beams supporting a bridge. An iron rod, fixed to the beam AB at the two ends, is kept at a distance by struts, c, c' . The beam cannot now be bent downward without stretching the rod; which thus has

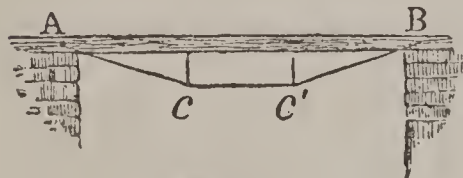


Fig. 8.

to bear the tensive strain, while the beam itself sustains only the compressive strain.

Another way of removing part of the strain from a girder is to fix a king-post, c , and two oblique pieces on its upper side, as in fig. 9. The whole is now one composite girder; and when any weight, f , bears on it, the whole of the compressive strain is thrown on the pieces a, b , and only the tensive strain is left for the beam to sustain.

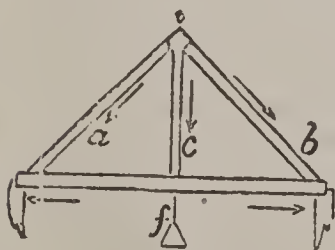


Fig. 9.

When a beam AB is fixed at one end and loaded at the other, the strain is greatest at B, and is less at other points,

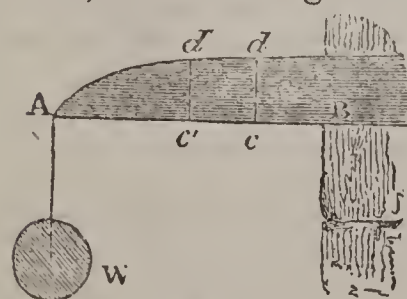


Fig. 10.

as c, c' , in proportion as Ac, Ac' , the levers at which it acts, are less than AB. The beam may therefore be made to taper off toward the end, and we may determine the exact form that the beam should have in order to be equally strong at every point. For supposing the breadth uniform, the strength increases as the squares of the depths $c'd', cd$, while the strain increases as the levers Ac', Ac ; and thus, if $Ac : Ac' :: cd^2 : c'd^2$, the strengths are equal at those points. This proportion will always hold good if the curve of the beam is that of a parabola; accordingly, this is the shape given to the beams of steam-engines.

STRENGTH OF MATERIALS.

In beams supported at both ends, the strain is greater in the middle; girders are therefore made strongest in the middle, and taper toward the ends.

4. *Shearing Strain*.—This force is called into play when a plate is cut by shears, or when a riveted or bolted joint is torn asunder, in which case the rivets are sheared across. The effect of it is to cause the particles in one plane to slide over those in another; this is resisted by their mutual coherence, and the magnitude of the resistance depends on the number of the particles, that is, on the area of cross-section of the body sheared. The following laws are the result of experiment—1. The ultimate resistance to shearing is proportional to the area of section of the bar sheared. 2. The ultimate resistance of any bar to a shearing strain is nearly the same as the ultimate resistance of the same bar to a direct longitudinal strain.

5. *Torsion*.—If one end of the axle or shaft of a wheel is immovably fixed, and a power acts at the circumference of the wheel (or at the end of a lever or winch), the power may be so increased as to twist the shaft asunder at its weakest point. If a shaft A has twice the diameter of another shaft B, there will be four times as many fibres in the section of fracture of A, to resist the twist, as in that of B. But as the separation takes place by the one end of the fracture turning round on the axis of the shaft, making the ends of the separating fibres describe circles, those fibres furthest from the centre will have greatest power of resistance, and the sum of their moments, or their united effect, will be in proportion to their mean distance from the centre. This mean distance in A is twice that in B; therefore the resistance in A is 2×4 , or 8 times the resistance in B. Generally, *the strength of shafts to resist torsion is as the cubes of their diameters*. The torsive strengths of shafts 1 inch diameter, and with weights acting at 1 ft. leverage, being found by experiment for different materials, the strength of shafts of other dimensions is found from these 'constants' by multiplying by the cube of the diameter, and dividing by the length of the lever. It is evident that the torsive strength of a hollow shaft will be greater than that of a solid one of the same quantity of material, on the same principle that its transverse strength is greater. The rule used by Boulton and Watt for calculating the diameters of their wrought iron shafts was as follows:

$$\text{Diameter of shaft in in.} = \sqrt[3]{\frac{120 \times \text{horse-power.}}{\text{Revolu. per minute.}}}$$

This is found to make the shafts rather too light; and the following variation gives safer practical results:

$$\text{Diameter of shaft in in.} = \sqrt[3]{\frac{240 \times \text{horse-power.}}{\text{Revolu. per minute.}}}$$

STRENUOUS—STRETTO.

STRENUOUS, a. *strĕn'ū-ūs* [L. *strenuus*, active, vigorous—connected with Gr. *strĕnēs*, rough, noisy: It. *strenuo*]; energetic; vigorous; eager; ardent; active; bold; zealous. **STREN'UOUSLY**, ad. *-lī*, vigorously; actively; with ardor. **STREN'UOUSNESS**, n. *-nēs*, the condition or quality of being strenuous; eagerness; activeness; zeal.

STREPITOSO, ad. *strā-pī-tō'sō* [It.]: in *mus.*, a direction that the passage to which it is attached is to be played in a noisy, impetuous manner.

STREPSIPTERA, *strĕp-sĭp'tē-ra* [Gr., twisted-wings] order of insects called **RHIPIPTERA** [Gr., fan-winged] by Latreille, but established first by Kirby. The name *S.* refers to the fore-wings, which are mere threads; the other term describes the hind-wings. The order *S.* consists of a small number of species, very remarkable in structure and habits, apparently a connecting link between *Coleoptera* and *Hymenoptera*, and are now classed as coleopters. The species all are small, and, in their larval state, live parasitically in the bodies of bees and wasps. The species form the two genera, *Stylops* and *Xenos*.

STREPT-, **STREPTO-**: combining forms, derived from Greek *streptos*, twisted (from *strepho*, turn). **STREPTOCOC-CUS**, n. [pl. *-cocci*]: a curved or twisted chain of micrococci.—See **BACILLUS**: **BACTERIA**: **SCHIZOMYCETES**.

STRESS, n. *strĕs* [OF. *estroissir*; F. *étrécir*, to straiten—from L. *stringĕrĕ*, to squeeze, to strain]: force; pressure (see **STRENGTH OF MATERIALS**): importance; urgency; force either acting or suffered; compulsion: V. in *O.E.*, for **DISTRESS**, to put to hardships.

STRETCH, v. *strĕch* [AS. *streccan*; Dan. *strække*; Sw. *sträcka*; Ger. *strecken*, to make tight]: to draw out to greater length or breadth; to bear extension without rupture; to spread; to expand; to strain to a greater space; to strain to the utmost; to carry or extend further than is right; to strain beyond the truth; to be extended: N. extension in length or breadth; effort; utmost extent or reach; course; direction. **STRETCH'ING**, imp.: N. the act of one who or that which stretches. **STRETCHED**, pp. *strĕcht*: **ADJ.** extended; made tense. **STRETCH'ER**, n. *-ēr*, one who or that which stretches; a piece of timber to keep other pieces extended; a brick or stone with its longer surface placed lengthwise in the face of a wall; a frame for carrying a person lying flat or slightly raised; a litter; an instr. for making boots or gloves somewhat easier. **STRETCHING-COURSE**, in masonry or brick-work, a course in which the stones or bricks are placed with their longest sides along the face of the wall. The stones are called *stretchers*, as those placed at right angles to them with their end exposed are called *headers*.

STRETTO, *strĕt'tō* [It., bound]: in *music*, a term denoting that the movement to which it is prefixed is to be performed with rapidity gradually accelerating toward the close.—The term *stretto* is applied also to the recurrence in a fugue of the subject in one part before it has come to a close in another: see **FUGUE**.

STREW—STRICKLAND.

STREW, v. *stró* or *strō* [Goth. *straujan*; Dut. *strooijen*; Ger. *streuen*; AS. *streowian*; Icel. *strá*; L. *sternĕrĕ*, to strew]: to scatter; to spread about loosely; same as **STROW**. **STREW'ING**, imp.: N. the act of scattering; anything strewn or fit to be strewed. **STREWED**, pp. *stród*. **STREWMENT**, n. *strō'mĕnt*, in *OE.*, anything scattered by way of decoration in honor of.



Striated Rock.

STRIÆ, n. plu. *stri'ĕ* [plu. of L. *stria*, a furrow, a channel]: fine thread-like lines or streaks; the filets between the flutes of columns. **STRI'ATE**, a. -*āt*, or **STRI'ATED**, a. -*ā-tĕd*, marked or impressed with thread-like lines; channelled; streaked. **STRIATION**, n. *stri-ā'shŭn*, state of being streaked or lined: see also **STRIGÆ**.

STRICH, n. *stri'k* [Gr. and L. *strix*, a screech-owl]: in *OE.*, a bird of ill omen.

STRICKEN, a. *stri'k'n* [see **STRIKE**]: smitten; advanced; far gone.

STRICKLAND, *stri'k'land*, AGNES: English authoress: 1806–1874, July 8; b. at her father's seat, Reydon Hall, near Scuthwold, Suffolk; third daughter of Thomas S. She was of a literary family. Her first compositions, mostly poetical, were anonymous contributions to periodicals. About 1825 she published, with her sister Susanna (afterward Mrs. Moodie), a volume of *Patriotic Songs*; followed 1826 by a little volume bearing her own name exclusively, and entitled *Worcester Field, or the Cavalier; a Poem, in Four Cantos, with Historical Notes*. This was followed by *The Seven Ages of Woman, and other Poems* (Lond. 1827); and this by *Demetrius, a Tale of Greece, in Three Cantos* (Lond. 1833), in the metre of Byron's *Corsair*. In 1836, she published a little volume, *Floral Sketches, Fables, and other Poems*; repub. 1861. Among her prose works are: *The Rival Crusoes*, without date; *The Pilgrims of Walsingham, or Tales of the Middle Ages, an Historical Romance* 2 vols. (1835); *Tales and Stories from History* (1836); *Alda, the British Captive* (1841); *Historical Tales of Illustrious British Children* (1847; new ed. 1858); *Historic Scenes and Poetic Fancies* (1850); *Old Friends and New Acquaintances* (2 series 1860–1). All these are of small import in comparison with her well-known work, *Lives of the Queens of England, from the Norman Conquest, with Anecdotes of their Courts*, 12 vols. (Lond. 1840–48; new ed., 8 vols., 1851–2). In this work, whose materials she discovered by diligently searching among the treasures of the British Museum and other great public repositories of historic documents, Miss S. was largely assisted by her sister Elizabeth, which she gratefully acknowledges in her Preface. It was dedicated to Queen Victoria; and its picturesque style and anecdotal character made it a general favorite, especially among

that class of readers whose object in reading history is rather amusement than philosophical instruction. Miss S. was an enthusiastic upholder of royalty and the English Church, and of the innocence of Mary, Queen of Scots. It is undeniable however that in these *Lives* she has added materially to our stock of historical information. Miss S.'s *Lives of the Queens of England*, concluding with the biography of Queen Anne, have been followed by *Lives of the Queens of Scotland*, and *English Princesses connected with the Regal Succession of Great Britain*, 8 vols. (Edin. and Lond. 1850-59); and these by *Lives of the Bachelor Kings of England* (Lond. 1861), containing the lives of William Rufus, Edward V., and Edward VI. Miss S. published a novel, *How Will It End?* (1865); *Lives of the Seven Bishops* (1866). In 1871 she received a pension of £100.

STRICKLE, n. *strikl'* [from STRIKE: Ger. *streich-holz*, a strickle—from *streichen*, to stroke]: an instr. to strike grain to a level with the measure; a strike; a stone for whetting scythes; an instr. used in the molding of pipes—also spelled *strikle* and *strickler*.

STRICT, a. *strikt* [L. *strictus*, drawn together, bound or tied tight—from *stringo*, I draw tight]: severe; rigorous; exact; governing by exact rules; limited; with rigorous accuracy; confined; accurate; not loose or lax. STRICT'LY, ad. *-li*, exactly; severely. STRICT'NESS, n. *-nēs*, the condition or quality of being strict; closeness; exactness in the observance of laws, rites, and the like; nice regularity or precision; harshness; severity. STRICTURE, n. *strikt'ūr* or *-chūr*, a glance; a touch of criticism; a critical remark; censure; in *med.*, a spasmodic or morbid contraction of any passage of the body (see below). STRIC'TURED, a. *-tūrd*, in *surg.*, affected with stricture.—SYN. of 'strict': exact; accurate; rigorous; close; tight; tense; nice.

STRICT OBSER'VANCE: in *chh. hist.*, a subdivision of the Observantine branch of the Franciscan order, founded probably in Spain 1489. In Italy they were known as the Reformed, early in the 16th c. In France they were called Recollects. The Latin holy places at Jerusalem are under the charge of the Franciscans of the Strict Observance.

STRIC'TURE, in Surgery: unnatural contraction, either congenital or acquired, of a mucous canal, such as the urethra, œsophagus, or intestine. When, however, the affected part is not mentioned, and a person is stated to suffer from S., the urethral canal is referred to. Contraction of this canal may be either permanent or transitory; the former is due to a thickening of the walls of the urethra, in consequence of organic deposit, and is hence termed organic stricture; while the latter may be due either to local inflammation or congestion, or to abnormal muscular action: the first of these varieties may be termed inflammatory or congestive S.; the second, spasmodic S. The spasmodic form seldom exists except as a complication of the other kinds of S. There are two principal causes of organic S.—the first being inflammation of the canal;

STRICTURE.

the second, injury by violence. Inflammation is by far the most frequent cause, and gonorrhea is the usual agent by which it is excited. Frequently, stimulating injections thrown into the urethra to check the gonorrheal discharge excite an inflammatory action which occasions S. Fortunately, it is only in exceptional cases that a S. results from inflammation of the urethra, the inflammation, in the great majority of cases, terminating by resolution, and leaving the canal as healthy as before. It is when the trouble assumes a chronic character that S. is its frequent result. S. from the second cause arises from such causes as falling across spars, scaffolding, ladders, etc., or on some sharp object which punctures the perinæum, e.g., from earthenware vessels which break under the sitter.

The earlier symptoms of S. are a slight urethral discharge and pain in the canal, behind the seat of the S., at the time of micturition. The stream of urine does not pass in its ordinary form, but is flattened or twisted; and as the disease advances, it becomes smaller, and ultimately the fluid may be discharged only in drops. The straining efforts to discharge the urine often induce Tenesmus (q.v.).

As the case advances the urine becomes alkaline and ropy; and deposits a precipitate when allowed to stand; and attacks of complete Retention (q.v.) occur with increasing frequency. But these symptoms are not in themselves sufficient to establish the presence of S. It is necessary to examine the urethral canal with a Catheter (q.v.) or Bougie (q.v.), to ascertain whether an organic obstruction exists, whether one or more strictures are present (as many as eight have been recorded, though rarely are there more than four, and one is the most common number), and their calibre. The treatment of organic S. is too purely surgical to be presented here; its object is twofold: first, to restore the natural calibre of the canal, so far as this can be safely effected; secondly, to maintain this patency, after it has been established.

Spasmodic S. may occur from any of the following causes: from organic S., or from inflammation of the mucous membrane; from acrid condition of the urine; from administration of cantharides, turpentine, etc.; and from voluntary retention of urine for too long a time. The treatment consists in the removal of the causes as far as possible, and the hot bath. The inhalation of chloroform sometimes gives immediate relief; and several cases are recorded in which, when the spasm occurred periodically, it was cured by quinine. Inflammatory or congestive S. arises usually when a recent purulent discharge from the urethra has been checked by external cold or wet. The patient complains of heat, fulness, and soreness in the perinæum; the passage of the urine is extremely painful, the stream being small, and ceasing before the bladder empties. The treatment is much the same as that for Retention of Urine (q.v.).

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